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# Annals of the Eastern Cape Museums

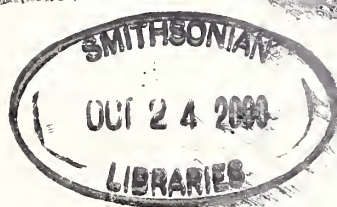
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# NOTES ON A COLLECTION OF REPTILES FROM ZAMBIA AND ADJACENT AREAS OF THE DEMOCRATIC REPUBLIC OF THE CONGO

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## ABSTRACT

The Port Elizabeth Museum collection holds nearly 500 reptile specimens from Zambia and adjacent south-eastern Democratic Republic of the Congo. These are reviewed, and biological and distribution data on 5 chelonians, 27 lizards and 38 snake species from Zambia are presented. These include information on 2 chelonians, 11 lizards and 19 snake species recorded from the poorly-known northern Mwinilunga District, Northwestern Province. Among the important findings are: the second largest specimen of and second Zambian locality for the dwarf terrapin, *Pelusios nanus*, with details on the first documented data on reproduction and sperm retention; the close proximity, without intergradation, of *Lygodactylus heenei* and *L. angularis* supporting elevation of the former to specific status; a range extension of about 345km and the most northerly record (Chingola) for the gecko *Lygodactylus chobiensis*; a north-westerly range extension of more than 300km (to Chingola) for the gecko *Hemidactylus mabouia* (both these records may be translocations); the third and fourth records for Zambia, and the most southern to date, for the gecko *Pachydactylus tuberculosus*; the first detailed biological information on the rare skink, *Mabuya ivensii*, which was first collected from Zambia during these collections; asynchronous reproduction in Sakeji populations of both *Mabuya maculilabris* and *M. wahlbergii*; a southern range extension to Shimabala for the rare skink *Eumecia anchietae*; a range extension for the skink *Lygosoma afrom* to Sampfy town; the first record of *Ichnotropis capensis* in the Copperbelt, and a north-westerly range extension of more than 300km to Chingola; the absence of asynchronous reproductive cycling between *Ichnotropis capensis* and *I. bivittata* in July at Sakeji; support for the specific status of *Limnophis bangewolicus* based on differences in colouration of the supralabials and subcaudals; new record sizes for both sexes of *Dipsadoboa shrevei shrevei*; a new record size for female *Psammophis brevirostris leopardinus*; and probable sympatry between *Naja annulifera* and its sister species *N. anchietae* at Livingstone.

**Keywords:** Herpetofauna, Zambia, Democratic Republic of the Congo

## INTRODUCTION

For the student of African herpetology, in many ways, Zambia remains an enigma. Bordered by the rich tropical rainforest of the Congo drainage in the west and by a series of rift valley lakes and isolated escarpments in the east, Zambia has a wealth of habitats and hosts a diverse herpetofauna. It could thus be expected to have attracted scientific attention, and yet it remains one of the most poorly documented herpetofaunas on the continent.

Among the first reports, Peracca (1896; 1910) listed material collected in the former Barotseland (now the Western Province of

Zambia), including the description of *Psammophis jallae*. He later documented material collected by Duchess Elene d'Aosta (Peracca, 1912), while Boulenger (1907) reported on a collection made in the Eastern Province. Angel (1920, 1921, 1922) commented on further Barotseland specimens and described a number of new species, including *Tetradactylus ellenbergeri*. It was not until 1934 that the first checklist of the herpetofauna of Zambia appeared, tucked away in Pitman's (1934) *Report on a faunal survey of Northern Rhodesia*. Subsequent reports included those of Loveridge (1933) on a small collection from the Northern



Province, and of Mertens (1937) on the herpetofauna of the Lake Bangweulo area. Vesey-FitzGerald's (1958) review of the Zambian snakes was followed by Broadley and Pitman (1960) on snakes collected in the Northern Province, and Wilson's (1965) account of a large collection of snakes from the Eastern Province. The herpetofauna of the Nyika plateau was reviewed by Stewart and Wilson (1966).

Broadley (1971a; 1973) was the first to attempt a modern summary of the Zambian herpetofauna, followed by reports on a large collection from the Northwestern Province (Broadley, 1991a, 1991b). Since then the remaining literature has consisted of anecdotes on individual species (e.g. Haagner, 1994) and additions to the Zambian herpetofauna (e.g. Broadley, 1983a; Branch & Haagner, 1993).

The Mwinilunga region in northwestern Zambia forms a pedicle wedged between Angola and Democratic Republic of the Congo (DRC) and was until recently one of the most poorly known regions in Zambia. A collection of reptiles and amphibians collected by Broadley (1991a,b) partly redressed this situation. However, Broadley's collections were made during the wet summer months and did not survey the herpetofauna present during the dry winter season. Between 7-26 July 1991, two of us (GH & AH) undertook a general collecting trip to the same area. Specimens were also obtained from areas of the adjacent Democratic Republic of the Congo. Several short trips were also made into the Central, Copperbelt and Luapula Provinces, where sporadic collecting was done. Additional specimens, collected subsequently around Chingola and from the Luiwa Plains are included. Miscellaneous historical material present in the Port Elizabeth Museum, particularly early collections by E Knowles-Jordan (1927-28, 39 specimens) and H Bredo (1943-45, 84 specimens), supplement the report (Additional material). Much of Knowles-Jordan's material consists of chelonians, including types, previously housed in the Albany Museum, Grahamstown.

## METHODS

Most material, except for a small series donated to the A J L Lambiris Herpetological Collection (AJL) in Kwazulu-Natal, has been deposited into the herpetological collection of the Port

Elizabeth Museum (PEM). Some comparative material from the Natural History Museum, Bulawayo (NZM), and the Transvaal Museum, Pretoria (TM), was examined. Details regarding the collecting localities are provided in the gazetteer (Appendix 1 and Fig.2). All localities listed in "Material examined" and "Additional material" are Zambian, unless otherwise noted. Snake ventral counts employ the Dowling (1951) system.

Biological data were mainly collected from recent material. The number of eggs counted in gravid snakes is presented as 12(7/5), representing total (right/left oviduct). Prey was identified to the lowest possible taxon, but in the case of the lizards, of which the diet consisted mainly of invertebrates, prey items were only identified to higher taxonomic categories (Alexander, 1968).

## OBSERVATIONS

### CHELONIA:

#### PELOMEDUSIDAE

*Pelusios nanus* Laurent 1956

**Material examined:** PEM R7248 (adult female), R7223 (hatchling and egg) - Sakeji School, Northwestern Province (1124AB). The female was retained alive in captivity. She had a carapace length of 119.4mm, plastron length of 104.5mm and weighed 259.2gm at the time of her death.

**Reproduction:** In April 1992, 10 months after capture, the female laid five eggs. Biometrics for the eggs are presented elsewhere (Haagner, 1994). It was the first report for reproduction in the species and the first of sperm retention in an African pelomedusid.

**Notes:** This is the second largest known specimen (Broadley, 1991a), and the second Zambian locality (Broadley, 1971a, 1991b). The species is more widespread in Angola and the DRC (Iverson, 1992).

*Pelusios rhodesianus* Hewitt 1927

**Additional material:** PEM R9590-91, 12373-75 - Mpika, Eastern Province (1131Cd), E Knowles-Jordan.

**Notes:** Broadley (1971a) records it as widespread throughout Zambia in swamps and pans. Five specimens form the types series of *Pelusios nigricans rhodesianus* Hewitt 1927. Hewitt did not specify a holotype from Knowles-Jordan's Mpika series. Broadley (1981)

designated Hewitt's figured specimen as the lectotype (AM 5432; re-accessioned PEM R12373); the remaining specimens become paralectotypes. He noted (Broadley, 1981) that the type material came from either south-east of Lake Bangweulu or from the Chambeshi River.

*Pelusios sinuatus* (A Smith 1838)

**Additional material:** PEM R9593, 12376 - Isoka, Northern Province (1032Ba); PEM R9596 - Luangwa Valley; PEM R9598 - Mpika, Eastern Province (1131Cd), E Knowles-Jordan.

**Notes:** Broadley (1971a) recorded it as widespread through Zambia in rivers and lakes. Four specimens form the types series of *Pelusios sinuatus leptus* Hewitt 1933. Hewitt did not specify a holotype from Knowles-Jordan's series and Broadley (1981) designated Hewitt's figured specimen as the lectotype (AM no number; re-accessioned PEM R12376); the remaining specimens become paralectotypes.

*Pelusios subniger* (Bonnaterre 1879)

**Additional material:** PEM R9594 - Swamps near Luangwa River, Mulilo, Eastern Province (1033Da); PEM R9599 - Luangwa Valley, Eastern Province; PEM R9600 - Chiwale, Luangwa Valley, Eastern District; PEM R9601-3 - Mpika, Eastern Province (1131Cd); PEM R9605 - Zambia, E Knowles-Jordan.

**Notes:** Broadley (1971a) recorded it as widespread throughout Zambia in swamps, pans and small dams.

## TESTUDINIDAE

*Kinixys spekii* Gray 1863

**Material examined:** PEM R6437 - 32km NE Mufilira, south-eastern DRC (1228Ba); PEM R6539 - Sakeji School, Northwestern Province (1124Ab). PEM R6539 (adult male) - carapace length 120.8mm, plastron length 110.4mm, shell length/height ratio of 2.07. A live male from the same locality had a carapace length of 154.7mm, plastron length of 132.1mm and shell length/height ratio of 2.24. PEM R6437 (sub-adult female) - carapace length of 112.4mm, plastron length of 89.7mm, shell length/height ratio of 2.36; plastron with dark, patterns radiating out towards the sutures; prominent ridge mid-dorsally on the carapace.

**Additional material:** PEM R14946-14947 - Isoka, Northern Province (1032Ba), E Knowles-Jordan (types of *Kinixys jordani* Hewitt 1931).

PEM R15020-22, 15024-25 - Isoka, Northern Province (1032Ba), E Knowles-Jordan; PEM R15023 - Isoka Plateau (1385m), E Knowles-Jordan; PEM R15026, 15028-29, 15031 - 95km east of Isoka, Luangwa Valley, E Knowles-Jordan; PEM R15030 - Luangwa Valley, near Isoka, E Knowles-Jordan; PEM R15027 - probably Isoka, E Knowles-Jordan; PEM R15032 - Noengo, Mulilo, Isoka District, E Knowles-Jordan.

**Diet:** The adult female had the skin and pips of berries and remains of millipedes in her faeces.

**Notes:** Hewitt did not specify a holotype. Broadley (unpublished) designated Hewitt's figured female specimen (Hewitt, 1931, xxxvii, Figs.7&9) as the lectotype (AM 5794; re-accessioned PEM R14946) and this is followed here. The remaining specimen (AM 5794; re-accessioned PEM R14947) becomes the paralectotype. Hewitt (1931) mentions six other specimens from the Isoko region in the type description. These are probably included with the other specimens listed, but it is not possible to distinguish which these specimens are.

## SAURIA:

### GEKKONIDAE

*Lygodactylus angularis* Günther 1893

**Material examined:** PEM R6268, 6270-71, 6273, 6275, 12484-85, 12493 - Chingola, Copperbelt Province (1227Bd); PEM R6269, 6272, 6276 - Chililabombwe, Copperbelt Province (1227Bd), PEM R12504-507 - Kitwe, Copperbelt Province (1228Cc), PEM R12508 - Ndola, Copperbelt Province (1227Bd): 6 males, 8 females and 3 sub-adults; snout/vent length of largest female 38mm (PEM R6274, R6275), and of largest male 81(37+44)mm. Nasals usually 3 (2 in PEM R6272), internasals 1, postmentals 2, lamellae under fourth toe 5, mental without clefts, rostral and first labial contacting the nostril. Unfortunately only three specimens had original tails giving a SV/tail ratio of 0.971 (range 0.857-1.058). Most specimens with yellow infusion on the throat with dark parallel lines. Throat pattern of PEM R6274 is diffuse, lower labials mottled with maroon and cream, back reddish grey, belly cream with scattered flecks, extending on ventral surface of tail, and under the limbs.

**Additional material:** PEM R7895 - Luangwe East, Eastern Province (1332Ad); PEM R1995 - Mbala, Northern Province (0831CD), H Bredo.

**Diet:** Only three of ten stomachs were empty.



The largest number of prey items in a single stomach was 8 (7 weevils and 1 pupae), whereas one stomach (PEM R6269) contained three prey species. The majority of prey items were Coleoptera (5), Diptera (5) (including maggots and pupae), Hemiptera (1), termites (2), Hymenoptera (4), Isoptera (1). Some of the stomachs also contained sand.

**Reproduction:** All females with 1 ova each per oviduct, ranging from 2.3-5.5mm in July to 4.6-4.8mm in December. During July only one male (PEM R6268) had mature testes; in two other males the testes were small and inactive. The smallest sexually mature male had a SVL of 32 mm. Other adult males had inactive testes during August (PEM R7895) and January (PEM R12504). During January a communal nest was found in an old car wreck with 18 fresh eggs and several hatched shells. Twelve undamaged eggs were collected and measured: length, mean 6.88mm, SD 0.13mm; width, mean 5.73mm, SD 0.13mm; not weighed. Although the eggs were retained and incubated, they failed to hatch. An adult female laid two eggs on 8 January, but these failed to hatch and were accessioned (PEM R12507). Their measurements fell within the ranges given above.

**Notes:** Although these arboreal geckos were collected basking on buildings and suburban trees during the day, they were often observed at night catching insects around outdoor lights, where they easily outnumbered *Hemidactylus mabouia*.

#### *Lygodactylus heenenii* Witte 1933

**Material examined:** PEM R6266 - 32km north-east of Mufilira, south-eastern DRC (1228Ba): 1 female measuring 70(38+32)mm with 3 nasals, rostral and first labial contacting the nostril, internasals 1, mental without clefts, postmentals 2, lamellae under fourth toe 6, preanal pores 7. Dorsum and base of tail with grey/brown vermiculations, throat pattern diffuse.

**Diet:** The stomach contained a small beetle and remains of a grasshopper.

**Note:** As the above population occurs in very close proximity to *L. angularis* without signs of intergradation, *L. heenenii* is best treated as a full species (Broadley, pers. comm.). It extends into adjacent Zambia at Sakeji (Broadley, 1991a).

#### *Lygodactylus capensis capensis* (A Smith 1849)

**Material examined:** PEM R12615 - Lealui pontoon, Zambezi River, Western Province, (1522Bb); PEM R12616-17 - Mongo, Western Province (1523Ac); PEM R12618, 12620 - Situnda Pan, Luiwa Plains National Park, Western Province (1422Da); PEM R12608 - Mumbwa, Central Province (1527Ab): 3 males and 3 females with 2 nasals, internasals 2, mental with lateral cleft, postmentals 3, preanal pores 6, lamellae under fourth toe 5, throat with irregular grey stippling.

**Additional material:** PEM R1996, 2197-98 - Lusaka, Central Province (1528Ad).

**Diet:** Only two stomachs were empty. The majority of prey items were Diptera (2) (including 1 maggot), Hymenoptera (3), Coleoptera (1), Orthoptera (2) and Isoptera (1). Simbotwe and Garber (1979) reported that Hymenoptera comprised 60% and Orthoptera 40% of the diet in *L. capensis* from the Dambwa Forest Reserve (1725Dd). The stomachs of two specimens (PEM R12615-16) contained skin pieces indicating keratophagy.

**Reproduction:** Only one female was gravid, with a single egg measuring 3.4x2.4mm.

#### *Lygodactylus chobiensis* FitzSimons 1932

**Material examined:** PEM R6267 - Chingola, Copperbelt Province (1227Bd); PEM R8864, 9030-31 - Shesheke, Western Province (1724Cb); PEM 12607 - Chirundu border post, Southern Province (1628Cc); PEM R12612-14 - Kalabo town, Western Province (1422Dc); PEM R12619 - Situnda Pan, Luiwa Plains National Park, Western Province (1422Da); PEM R12626 - Kalala Lodge, Lake Itzhi-Tezhi, Southern Province (1526Cc); PEM R12627 - Ngoma Camp, Kafue National Park, Southern Province (1525Dd); PEM R12628 - Musangwa lodge, Lake Itzhi-Tezhi, Southern Province (1526Cc); PEM R13810, 13838 - Gwabi Lodge, Kafue River, Southern Province (1528Dd): 18 adult specimens, largest male measuring 87(44+43)mm and the largest female 72(40+32)mm, and 2 hatchlings. Mental without clefts, rostral excluded from nostril. Colour pattern: faintly mottled background, with 2 series of 6-7 pale cream spots along either side of midbody. Vague dark brown stripe from nostril through the eye to the fore limb. Throat with double dark lines parallel to lower jaw.

**Additional material:** PEM R2193-96 - Lusaka, Central Province (1528Ad).

**Diet:** Only four stomachs contained food items. The majority of prey items were Diptera (2), Hymenoptera (2), Orthoptera (2), Isoptera (1).

**Reproduction:** Two females (PEM R2193-94) with small developing ova (<1mm); males with small, inactive testes (largest 3.6x2.1mm) during June. One female (PEM R8864) laid two eggs in the bag several days after collecting during January 1994. These measured 6.94x4.93mm, were incubated on damp tissue paper and hatched during the first week of March 1994. The hatchlings (PEM R9030-31) on average measured 26.56(14.8+11.7)mm. Haagner (1992) recorded similar egg sizes from a female collected at Kariba, Zimbabwe.

**Parasites:** None. Simbotwe (1983) reported nematodes (*Pharyngodon* sp.) from the stomach of a Lochinvar National Park specimen (1527Cd).

**Notes:** This species is largely restricted to the upper and middle Zambezi valley, but Broadley (1971a) also recorded it at Lusaka. The Chingola specimen is a range extension of about 345km and appears to be the most northerly record for the species. The possibility of accidental human translocation for the Lusaka and Chingola specimens cannot be ruled out (Broadley, pers. comm.).

*Hemidactylus mabouia* (Jonnés 1818)

**Material examined:** PEM R6330, 12486-88 - Chingola, Copperbelt Province (1227Bd); PEM R12492 - Lufwanyama farm, District Chingola, Copperbelt Province (1227Da); PEM R13874 - Gwabi Lodge, Kafue River, Southern Province, Sambia (1528Dd); PEM R12624-25 - Lufupa Camp, Kafue National Park, Northwestern Province, (1426Ca); PEM R12634 - Kalala Lodge, Lake Itzhi-Tezhi, Central Province (1526Cc); PEM R12606 - Kabulonga, Lusaka, Central Province (1528Ad); PEM R13874 - Gwabi Lodge, Kafue River, Southern Province (1528Dd): 7 adult males, the largest measuring 114(54+60)mm, and 2 adult females, the largest measuring 99(55+44)mm. Collected on buildings at night; several others seen but not collected. PEM R7153-54 is in a poor condition and partly mummified. One female (PEM R12606) has a partly regenerated bifurcate tail (sections measuring 16mm and 7mm respectively).

**Additional material:** PEM R7153-54 - Isoka, Northern Province (1032Ba); PEM R7152 - Luangwe valley, Eastern Province Zambia (1332Ad); PEM R1998 - Lusaka, Central Province (1528Ad).

**Diet:** Six specimens had identifiable prey items including Isoptera (3), Diptera (2), Lepidoptera (2), Coleoptera (2). PEM R7153 with a large (22mm) flying ant (Hymenoptera); PEM R12624 with two small spiders. The stomachs of two specimens (PEM R12625 and R12606) with pieces of skin, indicating keratophagy.

**Reproduction:** The testes of a male collected in July (PEM R6330) measured 6.73mm, whereas those of R7153 measured only 3.27mm in August, and of R12625 3.8mm in October. Two females collected in October with two eggs each, measuring 9.7x6.2mm.

**Parasites:** Stomach of female (PEM R12606) contained a nematode (14mm).

**Notes:** Although Broadley (1971a, 1977c) recorded this species as widespread in the low-lying areas of Zambia, no previous records appear to exist for the Copperbelt Province. The Chingola records indicate a north-westerly range extension of more than 300km.

*Pachydactylus punctatus* Peters 1954

**Material examined:** PEM R8865 - 27km west of Livingstone, Southern Province (1725Da); young adult female measuring 57(31+26)mm. Colour: above light brown with dark spots and confluent blotches. Below white with light upper labials.

*Pachydactylus tuberculosus* (Boulenger 1894)

**Material examined:** PEM R6329 - Nchelenge town, Luapula Province (0929Bc): adult female, total length 140(70+70)mm with original tail, collected while it was catching insects on a building under a light at night.

**Additional material:** PEM R1994 - Mbala, Northern Province (0831Cd), H Bredo: adult male with snout-vent length 52mm.

**Diet:** The female's stomach held 18 mosquitoes (Diptera) and 8 ants (Hymenoptera), whereas the male's stomach held a grasshopper.

**Reproduction:** The female had one egg in each oviduct, of 11.34x7.03mm and 9.45x7.43mm. The male's testes measured 4.6x2.9mm.

**Notes:** Broadley (1971a) recorded this species from the Northern Province at Nyamkolo (0831Ca) and Chiengi (0829Ca). These are only the third and fourth records for Zambia, and the Nchelenge record is the most southern to date.

#### AGAMIDAE

*Acanthocercus atricollis* (A Smith 1849).

**Material examined:** PEM R6360-66, 6369-70, 6372-73 - Sakeji School, Northwestern Province



(1124Ab); PEM R7125 - Musenga village, Copperbelt Province (1227Db); PEM R6367-68, 6371 - Sanolumbwa village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 6 males, 4 females and 5 juveniles. Largest male measured 351(146+205)mm and weighed 137.8gm; the largest female measured 305(135+170)mm and weighed 87.6gm. Two largest males (PEM R6371, 6368) with distinct bulge with heavily keratinized scales at base of tail, absent in juveniles and most females, although the largest female (PEM R6365 - snout-vent length 135mm) has enlarged scales at the base of the tail, but lacks the swelling. The reason for this sexual dimorphism is unknown, but may be related to aggressive male interaction. Juveniles with higher (0.823, SD. 0.036, range 0.776-0.864) SV/tail length ratio than adult females (0.819, SD. 0.035, range 0.794-0.844) and adult males (0.762, SD. 0.047, range 0.733-0.833).

**Additional material:** PEM R12316-17 - Isoka, Northern Province (1032Ba).

**Diet:** Only one adult specimen had an empty stomach; the largest number of prey species in any stomach was 5, and one stomach (PEM R6371) contained numerous black ants (6gm in total weight). The prey items included Coleoptera (5), Diptera (1), Hymenoptera (6), Orthoptera (3), Lepidoptera (3), Isoptera (1) and a small spider. Most important prey items were ants and caterpillars, which were present in all stomachs.

**Parasites:** The stomach of one large male (PEM R6371) contained numerous nematodes.

**Reproduction:** All adult males with mature testes; three adult females with numerous ova in July (mean 15, maximum 23) measuring 2-3mm in diameter.

*Agama armata* Peters 1854

**Material examined:** PEM R6263 - Sampfya Mission, Luapula Province (1129Bc): young male, length 111(50+61)mm; collected under building rubble; gular pattern reticulated.

**Additional material:** PEM R442-4, 447 - Mbala, Northern Province (0831Cd), H Bredo; PEM R12307-15 - Isoka, Northern Province (1032Ba), E Knowles-Jordan; PEM R2000-2003, Lusaka, Central Province (1528AD).

**Diet:** The stomach contained the remains of a cricket (Orthoptera).

**Parasites:** The stomach contained one small (8mm) nematode.

**Notes:** Jacobsen (1992) revised the *Agama aculeata armata* complex and elevated *A. armata* to full specific status, distinguishing it from *A. aculeata* on the basis of its dark reticulate gular pattern. However, there seems to be intergradation between the two patterns in Zimbabwe, and *distanti* may be a subspecies of *A. armata* (Broadley *et al.*, 1998).

## CHAMAELEONTIDAE

*Chamaeleo dilepis dilepis* Leach 1819

**Material examined:** PEM R6249-50, AJL 3608 - Sakeji School, Northwestern Province (1124Ab): 1 adult male and 2 adult females. The male (AJL 3608) measured 158(86+72)mm; largest female (PEM R6250) measured 225(120+105)mm. Other specimens were observed but not retained.

**Additional material:** PEM R551, 1285, 9000-2 - Lusaka, Central Province (1528AD); PEM R1287, 1289, 1302-4 - Mpokoroso, Northern Province (0930Ac); PEM R1307-13 - Mbala, Northern Province (0831Cd); H Bredo.

**Diet:** All stomachs contained food. Prey items included Coleoptera (1), Orthoptera (3), Hemiptera (1), and a small spider; grasshoppers were recorded in all stomachs.

**Reproduction:** The male's testes were 5.2mm in length and inactive; no female with mature ova.

## SCINCIDAE; LYGOSOMINAE

*Mabuya ivensii* (Bocage 1879)

**Material examined:** PEM R6342, 6344-50, NMZB 11826-27, AJL 3602, 3606 - Sakeji School, Northwestern Province (1124Ab), PEM R6343 - Salolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba); 8 males, 12 females, 7 juveniles. The SV/tail ratio of juveniles 1.93-2.08 (mean 2.03). Adults are sexually dimorphic: males with an average snout-vent length of 93.5mm, the largest male (PEM R6348) having a total length of 385(120+265)mm, giving a SV/tail ratio of 1:2.21; females with an average SVL of 115.6mm, the largest having a SVL of 148mm (PEM R6344; Fig.1). This specimen had a partly-regenerated tail of 125mm and weighed 52.4gm. The largest female with an original tail would have measured approximately 444mm in total length. The previous maximum size for the species was a female of 407(138+ 269)mm from Alto Cuilo, Angola (Laurent, 1964). A full description on scutellation and colour is given in Branch and Haagner (1993).





**Figure 1.** Adult male *Mabuya ivensii* (left - PEM R6348) and female (PEM R6344), showing sexual dimorphism and elongate habitus.

**Diet:** Only one of the 21 specimens had an empty stomach (two specimens were too damaged for their gut contents to be analysed). The maximum number of prey items in any stomach was five (in three stomachs). The commonest prey items were beetles, although grasshoppers were present in 61.11% of stomachs containing food. Prey items included: Coleoptera (13), Curculionidae (1), Orthoptera (11), Hemiptera (3), Lepidoptera larvae (3), Diptera (3), Odonata (2), Isoptera (2) and Araneae (7). A newly-metamorphosed, unidentified striped hyperoliid (9mm snout-urostyle length) was found in the stomach of one female (PEM R6352). Two large females (PEM R6354, 6346) contained extensive skin pieces (belly, flanks and limbs). It appeared to be conspecific, indicating keratophagy. Manacas (1963) noted spiders, hemipterans and beetles in the stomachs of two adults from Luso (= Luena).

**Parasites:** Gut nematode loads were very low, and only three specimens had single

nematodes in their stomachs.

**Reproduction:** Not one of 11 females contained obviously enlarged eggs or developing ova. Manacas (1963) noted that a female collected in October contained 4 well-developed embryos, suggesting that the species is viviparous.

**Notes:** The species appears to be partially aquatic. Laurent (1964) records that local people often found the lizard in their fish traps, and Manacas (1963) noted that the species lived in muddy terrain along river banks. Zambian specimens were regularly observed along the Sakeji stream, either foraging or basking on bankside vegetation. When disturbed they readily leaped into water and swam underwater with lateral undulations of the body and tail, escaping down-stream into submerged marginal vegetation. However, with the obvious exception of a frog, most prey items are terrestrial, indicating that the species does not forage in water despite its apparent aquatic habits. Smaller specimens entered water less readily, and scattered into the leaf litter when approached. Previously restricted to Angola, these are the first records of the species in Zambia and DRC. Branch and Haagner (1993) presented a morphological analysis of the *M. ivensii* group, rejecting the subspecies *septemlineata* Laurent 1964 and the monotypic genus *Lubuya* Horton 1972.

*Mabuya maculilabris* (Gray 1845)

**Material examined:** PEM R6307-08, R6310-17, R6319-28 - Sakeji School, Northwestern Province (1124Ab); PEM R6309, R6318 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba); PEM R6374 - 32km north-west of Mafulira border post, south-eastern DRC (1228Ba); 7 males, 14 females and 2 subadults; the largest male measuring 228 (84+144)mm and the largest female 229 (88+141)mm. No apparent sexual size dimorphism was noticed. Supraciliaries 5, midbody scale rows 29-34, 14-16 lamellae under fourth toe, supralabials 7, supralabials anterior to subocular 4, dorsals with 4-6 keels. Specimens uniform brown above, speckled with dark brown and white, speckling extending onto dorsum. Ventrums cream to yellow with some brown speckling on throat.

**Diet:** Five of the stomachs examined were empty, one was badly damaged, but the remainder contained a variety of food items. Prey items included: Orthoptera (7), Hymenoptera (5),

Coleoptera (2), Lepidoptera (1), Blattariae (2), Isoptera (2), Mantodea (1), Odonata (1), Diptera (1), Hemiptera (1), Araneae (1), and a snail.

**Reproduction:** All the mature males examined had mature testes with an average length of 8.93mm (SD. 0.72mm, range 8.0-10.0mm). Most of the females had developing ova of various sizes. Two females (PEM R6308 and AJL 3609) contained 5 and 6 enlarged ova (10-11x 6-7mm), respectively, in each oviduct. The mean number of ova per female was 8.6 (SD. 2.3, range 5-12). The presence of ova of varying sizes in females suggests that breeding is not synchronised or seasonal.

**Notes:** Commonly seen basking beside water and foraging in vegetable gardens and on school buildings. Loveridge (1933) collected specimens among thatching grass in Tanzania, whereas Robertson *et al.* (1963) found them mainly on or close to buildings. Broadley (1974) reviewed the *Mabuya maculilabris* complex, validating *M. boulengeri* as a full species, and considered typical *M. m. maculilabris* to be restricted to continental Africa. He recognised four insular races: (*M. m. infralineata*, Europa Island; *M. m. albotaeniata*, Pemba Island; *M. m. comorensis*, Comoro Islands; and *M. m. casuarinae*, Casuarina Island). Brygoo (1982, 1983) elevated both *comorensis* and *infralineata* to full species. Specimens from Fogo Island, Primeras Group, northern Mozambique are referable to *casuarinae*. Typical *M. maculilabris* occurs on the adjacent mainland (Branch, unpub. obs.). Both *M. casuarinae* and *M. albotaeniata* are here treated as full species, and *M. maculilabris* thus reverts to binomials.

#### *Mabuya varia* (Peters 1867)

**Material examined:** PEM R6304-06 - Sakeji School, Northwestern Province (1124Ab); PEM R8849 - 15km north-west of Shesheke, Western Province (1724Ad); PEM R12503 - Farm 4304, District Chingola, Copperbelt Province (1227Db); PEM R12629, R12631 - Kalala Lodge, Lake Itzhi-Tezhi, Central Province (1526Cc): 13 specimens, of which the largest measured 137(65+72)mm. Supraciliaries 5, midbody scale rows 34-37, supralabials 8, supralabials anterior to subocular 5, lamellae under fourth toe 18-20, dorsals with three keels. A common terrestrial species.

**Additional material:** PEM R7141-46 - Isoka, Northern Province (1032Ba), E Knowles-Jordan; PEM R471-79, 481 - Mbala, Northern

Province (0831Cd); PEM R480 - Mpulungu, Northern Province (0831Cc), H Bredo; PEM R8849, 15km north-west of Shesheke, Southern Province (1724Ad).

**Diet:** Main prey items included: Orthoptera (6), Isoptera (4), Hymenoptera (1), a small grub and a black spider. The stomach of PEM R6304 contained 32 immature termites; PEM R12629 had 21 worker termites in its stomach.

**Reproduction:** All three females contained ova measuring 9-10mm in diameter. Two of the females each had 7(4/3) ova; the others had 5 each. A female collected during January contained minute ova (<1mm); the testes of a male collected in October measured 4.7x2.9mm.

**Notes:** Lambiris (1994) also reported the species from Chombe village, Luna valley, Central Province (1429Db).

#### *Mabuya megalura* Peters 1878

**Additional material:** PEM R1991-93 - Mbala, Northern Province (0831Cd), H Bredo: 1 adult male measuring 158(50+108) and 2 females, the largest measuring 208(62+146)mm. Supralabials anterior to subocular 4, midbody scale rows 26-28, dorsal scales with 3-4 keels, lamellae under fourth toe 17-18.

**Diet:** Two skinks contained a grasshopper in the stomach.

**Reproduction:** The largest female (PEM R1993) had 7(3/4) developed ova (9.2x7.2mm) and the male had large active testes measuring 5.6x3.8mm in April. The smaller female (PEM R1992), SVL 42mm, was not sexually mature.

**Notes:** These remain the only specimens collected in Zambia (Broadley 1966a).

#### *Mabuya wahlbergii* (Peters 1869)

**Material examined:** PEM R6285, 6288 - Sampfya Mission, Luapula Province (1129Bc); PEM R6286, 6298, 12491 - Chingola, Copperbelt Province (1227Bd); PEM R6287, 6289-94, 6296-97, 6299, AJL 3607 - Sakeji School, Northwestern Province (1124Ab); PEM R6295 - Chistenga River, 209km west of Solwezi, Northwestern Province (1124Dd); PEM R6300 - Mbendele River, 42km north of Kariba, Southern Province (1628Bc); PEM R12609 - 13km west of Mumbwa town, Central Province Zambia (1526Bb); PEM R12610-11 Kalabo, Western Province (1422Dc); PEM R6302 - 32km north-east of Mufilura border post, south-eastern DRC (1228Ba); PEM R6303 - Sanolumba village, 46km north-east of Sakeji,



south-eastern DRC (1124Ba), a total of 23 specimens. Three size classes are apparent: juveniles, average SVL 44.8mm (SD. 1.47, range 44-47mm); subadults, average SVL 55.3mm (SD. 4.16, range 52-60mm), and adults, average SVL 77.7mm (SD. 3.55, range 72-85mm). The largest male measured 192(76+116)mm and the largest female measured 153(85+68 - tail broken)mm. Dorsum grey-brown above, pale dorsolateral stripes broad and ill-defined; midbody scale rows 35-39, dorsals 5-6 keels, supraciliaries 5, lamellae under fourth toe 19-24, supraciliaries anterior to subocular 5 (6 in PEM R1997), subocular not reaching the lip in two specimens (PEM R1997, R12610).

**Additional material:** PEM R7140 - Isoka, Northern Province (1032BA), E Knowles-Jordan; PEM R1997 - Lusaka, Central Province (1528Ad); PEM R452-3, 456-64, 466-7 - Mbala, Northern Province (0831Cd), H Bredo.

**Diet:** Juveniles were not examined. Only three of 13 stomachs were empty. The main prey items were: Hemiptera (5), Hymenoptera (3), Orthoptera (3), Coleoptera (2), Isoptera (1), Mantodea (1). An adult male (PEM R6289) contained a large piece of skin, indicating keratophagy. One stomach contained about 200 termite workers, but, in terms of mass or frequency in stomachs, the termites were relatively insignificant in the diet. Simbotwe and Garber (1979) reported that Isoptera comprised 91.4% of the diet in *M. striata* from the Dambwa Forest Reserve (1725Dd). However, such prey may be seasonally important.

**Reproduction:** During July all four adult males had mature testes (7-8mm long). Among mature females in July 2 contained no ova, possibly indicating they had recently given birth; 1 (PEM R6295) was not gravid, but contained 14 small (2mm) ova (6 in left and 8 in right oviduct); and 4 females had developing embryos - PEM R6296 had 3 ova (10.5x8.5mm) with small embryos; PEM R6297 had 2 full-term embryos (25+29mm) in each oviduct; PEM R6294 had 6 advanced embryos (21+23mm), 4 in the right oviduct and 2 in the left; and PEM R6287 had 7(4/3) ova (12x6mm), all, except 2 in right oviduct (which were infertile), contained small embryos. An additional female (PEM R12610) collected in October had several small ova (<2mm). The wide variation in reproductive state and embryonic development indicates that reproduction is asynchronous.

**Parasites:** Two females contained 2 and 6 ne-

matodes respectively. Simbotwe (1979, 1983) reported nematodes (*Thelandros* sp., *Abbreviata* sp., *Spirura* sp. and *Pharyngodon morgani*) from this species.

**Notes:** This terrestrial species was common on buildings, logs and trees and in and around houses. A young *Lamprophis fuliginosus* (SVL 380mm) collected in Chingola, regurgitated an adult *Mabuya wahlbergii* (SVL 78mm) which had been ingested head first. Broadley (1977a) recognized a number of races of *M. striata* and reported intergrades between *M. s. wahlbergii* and *M. s. striata* in the Northern Province near Lake Mweru. All races may now best be treated as separate species (Broadley, pers. comm.). The specific status of *M. wahlbergii* is also supported by molecular data (Mausfeld & Vences, pers. comm.).

*Mabuya margaritifer* (Peters 1854)

**Additional material:** PEM R9544-45 - Luangwa Valley, Eastern Province.

**Notes:** Broadley and Bauer (1998) have recently separated *M. margaritifer* from *M. quinque-taeniata*.

*Eumecia anchietae anchietae* Bocage 1870

**Material examined:** PEM R6337-6340 - Sakeji School, Northwestern Province (1124Ab), R12089 - Shimabala, 30km south of Lusaka, Central Province (1528Ca): 1 male measuring 169(131+38 - tail broken)mm, and 4 females, of which the largest measured 589(227+342)mm. The SV/ tail length ratio for two females with intact tails averaged 0.64. Supraciliaries 5, supralabials 7, midbody scale rows 22-24, 3 toes on the hind limb, dorsals with 1 faint keel.

**Diet:** All stomachs contained prey items. These included Orthoptera (3), Mantodea (1), Coleoptera (1) and Homoptera (1).

**Reproduction:** A male (PEM R6337), SVL 131mm, had mature testes. One female (PEM R6339; SVL 164mm) had 6(2/4) small (<3mm) developing ova. The largest female (PEM R6340) contained 9(4/5) ova (5mm in diameter). The remaining female (PEM R6338; SVL 141mm) contained 7(4/3) ova with obvious embryonic development. The species is viviparous with unique matrotrophic placentation (Flemming & Branch, 1998). Another female (PEM R12089; SVL 176mm), collected in December, had very small (<1mm) developing ova.

**Notes:** The Shimabala (1528Ca) specimen appears to be the most southern distribution for



the species, extending the known range slightly from Broadley's (1971a) Lusaka record. This poorly-known species appears to be one of the largest skinks (at least in terms of total length) in the world. Laurent (1964) recorded a massive female of SVL 300mm, indicating a possible total length of approximately 750mm.

*Lygosoma afrum* (Peters 1854)

**Material examined:** PEM R6426 - Sampfya town, Luapula Province (1129Bc); 1 sub-adult measuring 142(89+53)mm, mass 10.4gm.

**Notes:** The only other Zambian records are to the north on the Tanzanian border with one isolated specimen from the Luangwe Valley (Broadley, 1966b).

*Lygosoma sundevallii* (A. Smith 1849)

**Additional material:** PEM R485 - Mweru Wantipa, Northern Province (0829Db), H Bredo.

**Notes:** Widespread in Zambia (Broadley, 1971a).

*Panaspis wahlbergii* (A. Smith 1849)

**Material examined:** PEM R6331-33 - Sampfya Mission, Luapula Province (1129Bc); PEM R12630, 12632 - Kalala lodge, Lake Itzhi-Tezhi, Central Province (1526Cc); 2 adult males measuring 77(41+36)mm and 3 adult females, the largest measuring 89(42+47)mm. Supraciliaries 4-5, supralabials 7-8, supralabials anterior to subocular 4-5, lamellae under 4th toe 17-19, midbody scale rows 28-29. A male (PEM R12630) collected in October had a bright orange throat. A juvenile (PEM R12632) appeared newly born and measured 33.5 (14.2+19.3)mm.

**Additional material:** R1872 - Mbala, Northern Province (0831Cd), H Bredo.

**Diet:** All stomachs contained food items, including Isoptera (in three stomachs, one containing 27 worker ants), and 1 small jumping spider. An adult female (PEM R6333) contained the shed skin of a foot. The pattern matched that of the specimen, which appeared to have freshly shed. This would seem to be conspecific and would indicate keratophagy.

**Reproduction:** The male had mature testes and the females contained 4(2/2) and 5(3/2) ova, measuring 2-3mm in diameter, but no obvious embryos.

**Notes:** Very common amongst dry leaf litter, active mostly during mid-morning and late afternoon. The taxonomy is confused, and the 'species' includes a number of cryptic species

(Jacobsen & Broadley, in press). The Zambian material has been treated conservatively as *P. wahlbergii*.

## LACERTIDAE

*Latastia johnstoni* Boulenger 1907

**Additional material:** PEM R7148-50 - Isoka, Northern Province (1032Ba), E Knowles-Jordan. Specimens in poor condition and partly dehydrated; 2 adult males and 1 female, the largest measuring 111(54+57 - tail broken)mm. Nasals usually 2 (3 in PEM R7149), supraciliaries 5, supralabials anterior to sub-ocular usually four (5 in PEM R7149), 47-51 dorsal scale rows, lamellae under fourth toe 22-26.

**Reproduction:** The female had two well-developed ova (4.8x3.6mm), but the males' testes appeared inactive (3.2x2.1mm).

*Nucras boulengeri* Neumann 1900

**Additional material:** PEM R7147 - Isoka, Northern Province (1032Ba), E Knowles-Jordan. Specimen in poor condition and partly dehydrated: 56+82mm. Supralabials anterior to sub-ocular 4, supraciliaries 4, nasals 5, internasals 1, postmentals 2, lamellae under fourth toe 20, midbody scale rows 40.

**Notes:** This remains the only specimen known from Zambia (Broadley, 1971a) and the most southern record for the species.

*Ichnotropis bivittata bivittata* (Bocage 1866)

**Material examined:** PEM R6280, R6284 - Sakeji School, Northwestern Province (1124Ab); 1 adult male measuring 126(42+84)mm and 1 adult female, SVL 40mm. Supralabials 8, midbody scale rows 38-39, lamellae under 4th toe 17-18.

**Diet:** The female contained a large grasshopper and 16 ant mandibles; the male contained 5 ant mandibles.

**Reproduction:** The male's testes measured 4.2x2.7mm; the female contained no developing ova.

**Notes:** PEM R6280 was removed from the stomach of a *Thelotornis oatesi* (PEM R6195). This species was known from only one specimen from Mbala, Northern Province (0831Cd), until 1957, when Frank Ansell collected another (NMZB 1511) in the Northwestern Province. The above are only the third and fourth specimens for Zambia. Adults of both *I. bivittata* and *I. capensis* were collected from Sakeji during July, and it may be significant that *I. bivittata* had

only eaten ants and *I. capensis* contained only termites (Broadley, pers. comm.).

*Ichnotropis capensis* (A. Smith 1838)

**Material examined:** PEM R6277-80, 6282-83 - Sakeji School, Northwestern Province (1124Ab); PEM R12489-90 - Chingola, Copperbelt Province (1227Db); PEM R12621 - Situnda Pan, Luiwa Plains National Park, Western Province (1422Da); PEM R12622-23 - Siyenge Pans, Luiwa Plains National Park, Western Province (1422Dd): 12 adult males, the largest measuring 189(64+125)mm; 6 adult females, the largest intact specimen measuring 164(61+103)mm. Another female (PEM R1999) had a SVL of 68 mm. Light brown dorsum with well developed lateral lines, absent in one female (PEM R6277). Supralabials 8, supralabials anterior to subocular 4, midbody scale rows 38-40, lamellae under fourth toe 19-22, prefrontal not in contact with anterior supraocular.

**Additional material:** PEM R6394-97 - Isoka, Northern Province (1032Ba), E Knowles-Jordan; PEM R1999 - Lusaka, Central Province (1528Ad); PEM R2817-18 - Mbala, Northern Province (0831Cd), H Bredo; PEM R12318-21 - Balovale, Northwestern Province (1323Ca).

**Diet:** Only two stomachs were empty. Prey items included: Isoptera (6), Orthoptera (7), Coleoptera (3) and Araneae (3). Four specimens from Sakeji all contained numbers of worker termites: PEM R6278 with 48, R6283 - 32, R6281 - 29 and R6279 with 27. The last also contained a small cricket and one Chingola specimen (PEM R12489) contained 22 worker termites, 6 termite heads and one soldier. Simbotwe and Garber (1979) reported that Isoptera comprised 99.6% of the diet of *I. capensis* from the Dambwa Forest Reserve (1725Dd).

**Reproduction:** An adult Sakeji female (PEM R6277) contained no developing ova during July; a female from Lusaka (PEM R1999) had 6(3/3) ova (6.8x4.2mm) in December; and 2 females (PEM R2817-18) from Mbala had 7(4/3) and 6(3/3) ova, respectively, (4.3-4.6x2.9-3.8mm) in December. Males collected during January had a rich bronze-brown colour and their testes appeared inactive (flaccid, 3.2-4.6x2.6-3.2mm). Three males collected during October (PEM R12621-23) were in breeding colouration (bright orange flanks, dorsolateral white line, dorsum rusty brown,

ventrum cream) with large testes (6.0-6.8x2.8-3.1mm).

**Parasites:** None found. Simbotwe (1979) reported nematodes (*Parathelandros* sp.) from the stomach of a specimen from Dambwa Forest Reserve (1725Dd).

**Notes:** Although Broadley (1971a) recorded this species as widespread in western Zambia, no previous records appear to exist for the Copperbelt Province. The Chingola records indicate a north-westerly range extension of more than 300km. Broadley (1979) recorded asynchronous reproductive cycling between the 'annual' lizards *I. capensis* and *I. squamulosa*. The presence of adults of both *I. capensis* and *I. bivittata* in July at Sakeji mitigates against the same phenomenon occurring between the latter two species.

## GERRHOSAURIDAE

*Gerrhosaurus bulsi* Laurent 1954

**Material examined:** PEM R6251-54, 6256, 6258, 6260-62, AJL 3744 - Sakeji School, North-western Province (1124Ab); PEM R6255, 6257, 6259, AJL 3610 - Sandolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 14 specimens; largest male 441(181+260)mm, largest female 505(184+321)mm. Eight adults with 24 dorsal scale rows and 4 with 26; supralabials anterior to subocular 3; femoral pores 14-18; lamellae beneath fourth toe 15 (16 in PEM R6252). Proximal supra-caudal scales mucronate and spiny with the exception of PEM R6258 which lacks strongly spinose scales. Grey to golden brown above, some with bluish colouring on the sides of the neck and head, ventrum cream-white. The first development of the bluish colour was noticed on a subadult male (SVL 130mm).

**Diet:** Only three stomachs were empty. The main food items included Hemiptera (5), Orthoptera (4), Coleoptera (2), Isoptera (2), as well as vegetable material, including small red berries, fruit pips and plant stems. One female (PEM R6254) had large yellow fat bodies.

**Reproduction:** In July 3 males had mature testes (7.5-9.0mm), whereas 3 females had small clusters (5-8) of developing ova (2-3mm) in their ovaries.

**Parasites:** Four stomachs contained up to 8 nematodes.

**Notes:** These large plated lizards were very common in the woodland and were often found basking near their burrows. The largest female



(PEM R6262) exceeds the previous maximum size of 495mm reported for the species, although not the maximum SVL of 200mm (Broadley 1991a). Broadley (1999) notes that the taxon *G. multilineatus* Bocage is based on a hybrid specimen. The name is therefore unavailable.

*Tetradactylus ellenbergeri* (Angel 1922)

**Additional material:** PEM R1982-86 - Mbala, Northern Province (0831Cd); H Bredo: 1 adult male (PEM R1983), measuring 259(69+190 - tail regenerating)mm, and 4 adult females, the longest (PEM R1984) measuring 260(57+203)mm. Another female (PEM R1986) has a larger SVL of 72mm. Broadley (1971a) recorded a specimen from Mambwe (0931Bb) with a SVL of 74mm. All specimens had 12 longitudinal rows of dorsals, ventrals in 6 longitudinal rows, a single nasal, and monodactyle and minute hindlimbs.

**Diet:** All stomachs contained food, including Orthoptera (4), Hymenoptera (1), Homoptera (1), Coleoptera (1) Lepidoptera (1), Anaeae (6), and a snail (1). PEM R1983 contained all 5 different insect prey items from the above list.

**Reproduction:** All females, collected in April, had ova in various stages of development: PEM R1985 had three small ova <1.0mm in diameter; those in PEM R1987 measured 2.17x1.84mm, and in PEM R1982 3.69x3.07mm. The largest female (PEM R1986) contained 2 eggs, 1 per oviduct, measuring 11.62x5.71mm. The only male had well developed testes, measuring 4.65mm.

**Notes:** The Zambian distribution of this species is only known from Mambwe (0931Bb), Luangwe Game Reserve (1332Ad), Lusaka (1528Ad) and Ikelenge (1124Ab) (Broadley, 1971a). The Mbala specimens represent a north-western range extension within Zambia.

#### CORDYLIDAE

*Chamaesaura miopropus* Boulenger 1894

**Material examined:** PEM R6335-36 - Sakeji School, Northwestern Province (1124Ab); PEM R6334 - Sandolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 1 adult male (PEM R6336) measuring 489(89+400)mm, and 2 adult females, largest measuring 573(120+453)mm. All possess minute forelimbs, 4.4-4.5% of SVL, and monodactyle hindlimbs, 6.8-7.5% SVL; supralabials anterior to subocular usually 3 (2 in PEM R6335), midbody

scale rows 23-24.

**Diet:** One stomach (PEM R6336) contained a small grasshopper and the remains of a wasp.

**Reproduction:** The male had elongate testes (3.9x2.1mm) and only the largest female (PEM R6335) had small developing ova (<2mm) in the ovaries.

**Notes:** Although *C. miopropus* has usually been treated as a northern race of *C. macrolepis* (Broadley, 1966a; 1971a) it is geographically well-isolated and best treated as a separate species, distinguished by the presence of vestigial forelimbs.

#### SERPENTES:

##### TYPHLOPIDAE

*Rhinotyphlops mucruso* (Peters 1854)

**Additional material:** PEM R714-19, 1319-20, 1323, 12091 - Mbala, Northern Province (0831Cd), H Bredo: 10 specimens of which the largest measured 334(326+8)mm. Seven specimens had a uniform brown dorsal colour with a cream vent (illustrated in Broadley, 1971a), whereas the remaining 3 (PEM R716, 1323, 12091) had a more typical blotched pattern with a cream vent.

**Notes:** Wilson (1965) noted that only 24.3% of 74 specimens had the typical blotched colouration, with the remainder being uniform brown. Previously treated as a northern race of *R. schlegelii*, this form is best treated as a full species (Broadley, pers. comm.). The genus *Rhinotyphlops* was revived by Roux-Estève (1974) and recently validated by Wallach (1994).

*Rhinotyphlops gracilis* (Sternfeld 1910)

**Additional material:** PEM R713 - Mbala, Northern Province (0831Cd), H Bredo: 1 adult specimen, 501(495+6)mm, uniform brown in colour.

**Notes:** Referable to the genus *Rhinotyphlops* (Wallach, 1994; Wallach, in. litt.). Restricted to the northern provinces (Broadley, 1971a).

##### LEPTOTYPHLOPIDAE

*Leptotyphlops kafubi* (Boulenger, 1919)

**Material examined:** PEM R12483 - Chingola, Copperbelt Province (1227Bd): 1 specimen (66+7mm) of undetermined sex. Rostrum separated from supraocular by nasal, supraocular larger than prefrontal, tail length 9.6% of total length. Colour: uniform brown above with light brown ventrum.

**Notes:** Found during August in damp soil under large stone in domestic garden. Previously



treated as *L. emini* (Broadley 1971a), this species, which is widespread in the North-western and Copperbelt Provinces, has recently been revived (Broadley and Broadley 1999) .

## COLUBRIDAE

*Lamprophis fuliginosus* (Boie 1827)

**Material examined:** PEM R6184-85 - Sakeji School, Northwestern Province, (1124Ab); PEM R7047, R12502 - Chingola, Copperbelt Province (1227Bd); PEM R7134-35, 8049, 9533, 9534 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db); sight record (captured and measured); Situnda Pan, Luiwa Plains National Park, Western Province (1422Da): 2 adult males, largest 590(482+108)mm; 2 adult females, largest 1122(988+134)mm; 3 sub-adult females and 4 juveniles. Adults and sub-adult olive green dorsally, juveniles grey-green with cream bellies. The juveniles appeared to have been the previous season's (November-December 1990) hatchlings, as the largest measured 228(196+32)mm. Midbody scale rows 26-29; ventrals 191-196 in males, 201-220 in females; subcaudals 56-61 in males, 48-49 in females.

**Additional material:** R754 - Mbala, Northern Province (0831Cd); H Bredo.

**Diet:** A young snake (SVL 380 mm) collected in Chingola, regurgitated an adult *Mabuya wahlbergii* (SVL 78mm) which was ingested head first and well-digested. Except for PEM R9534, which had a well digested rodent in the stomach and rodent hair in the hind gut, all other stomachs were empty. The adult female had large fat deposits.

**Reproduction:** The adult males had mature testes and the single female was gravid with 11 (6/5) ova (24x14mm). A large female (PEM R12502) collected during January contained numerous small ova (<2mm).

**Parasites:** One nematode was present in the stomach of the sub-adult female.

**Notes:** The Chingola female (PEM R12502) may be the largest house snake yet collected in Zambia. It is considerably bigger than the average specimen encountered.

*Lycophidion multimaculatum* Boettger 1888

**Material examined:** PEM R11663 - Kafulafuta, Copperbelt Province (1328Bd). One juvenile and one subadult male, the latter measuring 273 (236+37)mm. Colouration: dark ventrals and dense white stippling along the back.

Ventrals 162-165, paired subcaudals 35-36, midbody scale rows 17, anal entire, supralabials 8 (3rd, 4th and 5th entering orbit), infralabials 8 (first 5 in contact with the anterior sublinguals).

**Additional material:** PEM R1976 - Mweru Wantipa, Northern Province (0829Db), H Bredo.

**Reproduction:** The testes of the largest male were inactive and flaccid and measured 7.2mm

**Notes:** Broadley (1996) revived *L. multimaculatum* as a full species from *L. capense*. It is known only from western and northern areas of Zambia. The Kafulafuta records fills a gap between Lusaka and Chingola records (Broadley, 1996).

*Natriciteres bipostocularis* Broadley 1962

**Additional material:** PEM R1973 - Mpokoroso, Northern Province (0930Ac), H Bredo: 1 young snake measuring 232(157+75)mm. Midbody scale rows 17, ventrals 136, subcaudals 72, supralabials 8 (4th and 5th entering orbit), infralabials 8 (first four in contact with anterior sublinguals); postoculars 2, temporals 1+2. The specimen had dark vertebral and lateral stripes and dark brown dorsolateral stripes.

**Notes:** The isolated populations of the *N. variegata* complex are best treated as separate species (Broadley, pers. comm.)

*Natriciteres olivacea* (Peters 1854)

**Additional material:** PEM R879 - Lake Cheshi, Northern Province (0829Dd); PEM R1975 - Mweru Wantipa, Northern Province (0830 Cc), both H Bredo: 1 adult male, 329(273+56)mm and 1 adult female, 377(371+6 - tail truncated and healed)mm. Ventrals 140 in male, 142 in female; subcaudals 31 in male; supralabials 8 (4th and 5th entering orbit); infralabials 10 (first 5 in contact with anterior sublinguals).

**Reproduction:** The female (PEM R1975) contained 7(4/3) eggs (21.2x10.6mm) and the male's testes measured 10.2x6.9mm.

*Limnophis bicolor* Günther 1865

**Material examined:** PEM R6172-82, 6554 - Sakeji School, Northwestern Province (1124Ab): 8 males, largest 460(355+109)mm; 4 females, largest 501(407+94)mm. Ventrals 132-137 in males, 132-137 in females; subcaudals 51-54 in males, 40-46 in females; supralabials 8 (9 in PEM R6181, 6172), 3rd and 4th entering orbit; infralabials 10 (first 4-5 in contact with anterior sublingual); preocular 1 (rarely 2); postoculars

2 (3 on one side of PEM R6554); temporals 1+2 (1+3 in R6178); anal divided; midbody scale rows 19; parietals narrowly separated from the 6th supralabial in all specimens by anterior temporals; supralabials creamy in colour with dark anterior borders.

**Diet:** PEM R6179 had a partly digested tadpole in the stomach.

**Reproduction:** All females with small developing ova, ranging from <2mm to the largest at 5.3x2.8 mm (in PEM R6174, which had 18(11/7) ova). The male's testes were inactive and flaccid. The hemipenis (based on the well-everted organs of PEM R6178, 6176, 6177) measured from 10-13.5mm in length, reaching the 9th subcaudal when reflected along the tail; it is undivided, with the distal third to a quarter of the organ forming a thin terminal awn; ornamentation undifferentiated, without enlarged basal spines, the body of the organ covered in 16-18 longitudinal rows of ossified, non-webbed spines, that reduce in size gradually towards the awn and base, and largest approximately a third along the organ from the base; sulcus undivided with slightly raised lips, running to the tip of the awn.

**Note:** Broadley (1971a) initially considered the race *L. b. bangweolicus* to inhabit the Upper Zambezi flood plain. However, he later recorded (Broadley 1991a) a single specimen of *L. bicolor* from Ikelenge in the Mwinilunga District, noting that it was typical of *bicolor* in all respects, except that the parietal was narrowly separated from the 6th supralabial by the anterior temporal. As the two races in north-western Zambia were in close proximity, with populations of *bangweolicus* occurring to the north and south of Ikelenge locality, he provisionally treated *L. bangweolicus* as a full species (Broadley, 1991a & b), returning the typical race to binomials. The large series (12 specimens) from Sakeji in the Mwinilunga District confirms and amplifies Broadley's findings. Subtle differences in coloration occur between the species. The supralabials of *L. bicolor* are barred with dirty cream centres and black borders; in *L. bangweolicus* the supralabials are diffusely striped, with a pale cream central stripe bordered above and below with olive. The subcaudals in *L. bicolor* are also uniform yellow-cream, whereas those in *L. bangweolicus* have fine, dark margins.

*Limnophis bangweolicus* (Mertens 1936)

**Additional material:** PEM R22, Merwu Wantipa, Northern Province (0830 Cc), H Bredo; PEM R7249-50 (previously UM10090-91) - Kalobo, Western Province (1422Dc): 2 adult females, largest 495(401+94)mm; 1 adult male, 435(333+102)mm. Ventrals 133 and 138 in females, and 150 in the male; subcaudals 43 in both females, and 60 in the male.

**Diet:** Both Kalobo snakes had well-digested fish remains in the stomach.

**Reproduction:** The large Merwu female, collected in January, contained 5(2/3) large ova (28x15mm); the Kalobo female, collected in December, was sexually mature, but the ovaries contained only small follicles (<3mm); the Kalobo male, collected in December, was also sexually mature, with large testes (12x5mm) and convoluted, milky efferent ducts.

**Note:** Broadley (1991a) questioned whether the marked difference in head shape between the two species (see Laurent, 1964) reflected differences in feeding habits. The gut contents presently support this, but further information is required.

*Grayia tholloni* Mocquard 1897

**Additional material:** PEM R23, Lake Chesi, Merwu Wantipa, Northern Province (0830 Cc), H Bredo: 1 male; scutellation details have been presented elsewhere (Broadley, 1983a). Recorded from only one other Zambia locality (Isombo; Broadley, 1991a).

*Scaphiophis albopuntatus* Peters 1870

**Additional material:** PEM R24, 'Chansa Masanka' (probably Mansanka Flats, just east of Mweru Wantipa), Northern Province (0830Cc), H Bredo: juvenile female, ventrals 189; subcaudals 53.

**Notes:** Broadley (1994) revised the genus, reviving *S. raffreyi* for Ethiopian populations; Northern Zambia is the southern limit of the species.

*Prosymna ambigua ambigua* Bocage 1897

**Material examined:** PEM R855 - Mbala, Northern Province (0831Cd), H Bredo: 1 large male measuring 251(206+41)mm. Uniform dark grey-brown above and dark vent. Ventrals 137, subcaudals 32, supralabials 7 (3rd and 4th entering orbit) infralabials 7 (first 3 in contact with anterior sublinguals).



**Reproduction:** The testes were turgid and large (17.2x4.6mm).

**Notes:** The Mbala population has been known for sometime (Vesey-FitzGerald, 1958; Broadley & Pitman, 1960; Broadley, 1971a, 1980). Despite his initial reservation (Broadley, 1971a), Broadley (1980) first recognized *stuhmanni* as an eastern race of *ambigua*, and then elevated it to a full species (Broadley, 1992). Trinomials are retained because of the western race, *P. a. bocagii*. The Mbala population represents the only locality for *P. ambigua* in Zambia.

*Dromophis lineatus* (Dumeril & Bibron 1854)

**Additional material:** PEM R025 - Mweru Wantipa, Northern Province (0829Db), H Bredo: 1 adult female, 404(288+116)mm. Ventrals 152, subcaudals 84, supralabials 8 (4th and 5th entering orbit), infralabials 9 (first three in contact with anterior sublinguals), postoculars 2, temporals 1+2.

**Diet:** There were lizard scales and insect remains (possibly secondary prey) in the hind gut.

*Psammophis angolensis* (Bocage 1872)

**Material examined:** PEM R6207 - Sakeji School, Northwestern Province (1124Ab); PEM R7132 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db): 2 adult males, largest 422(312+110)mm. Midbody scale rows 11, ventrals 133-137, subcaudals 58-67.

**Diet:** One specimen contained an adult *Panaspis wahlbergii*.

**Reproduction:** Both males had mature testes, measuring 14-16mm.

*Psammophis mossambicus* Peters 1882

**Material examined:** PEM R6225-29, 6231-36, 6238-43, 6245-48 - Sakeji School, Northwestern Province (1124Ab); PEM R7123-24, 8048, 8065-67, 12096 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db); PEM R12494 - Lufwanyama farm, District Chingola, Copperbelt Province (1227Da); R6230, R6244 - Sanolumba village, south-eastern DRC (1124Ba); PEM R12095 - Chingola, Copperbelt Province (1227Bd), PEM R6555 - Kitwe, Copperbelt Province (1228Cc): 34 specimens; 23 males, largest 1741(1280+461)mm; 8 females, largest 1391(1020+371)mm, and 3 juveniles. All specimens with 17 midbody scale rows; ventrals 169-176 in males, 175-177 in females; subcaudals 89-103 in

males, 92-96 in females; supralabials 8 (4th and 5th entering orbit); infralabials 9 (first four in contact with anterior sublinguals); anal divided, postoculars 2, postnasals 2, temporals 2+2. Coloration of nearly all specimens a uni-form olive green/grey with 3 males showing a change to yellow on the posterior third of the body; ventrals black bordered. One gravid female (PEM R6230) from DRC with yellow coloration to the ventrum, from the area above vent to the tail tip.

**Additional material:** PEM R988 - Mbala, Northern Province (0831Cd), H Bredo.

**Diet:** Many of the Musenga specimens had eaten; one male (PEM R8067) had a well-digested frog in the stomach, possibly a ranid; another male (PEM R12095) a half-digested rodent in the stomach and rodent hair in the hindgut; PEM R7124 and 12096 also had rodent hair in the hindgut; a juvenile had the hind foot of a small rodent in the stomach and rodent hair and lizard scales in the hindgut; a large female (PEM R7123) had the tail of a large tree agama (*Acanthocercus atricollis*) in the stomach.

**Reproduction:** Three females were gravid: PEM R6230 contained 18(12/6) well-developed ova (27.2x16.2mm). The other two females had 11(6/5) ova (25.1x12.5mm) and 13(7/6) ova (12.6x8.4mm), respectively. An adult female (PEM R6555), collected alive in Kitwe (1228Cc) laid 14 eggs on 8 October; length - mean 25.72mm, SD. 1.21mm, range 24.6-28.8mm; width - mean 15.77mm, SD. 1.55mm, range 13.2-19.2mm; mass - mean 3.42gm, SD. 0.73gm, range 3.1-5.0gm. These were incubated on moist vermiculite but failed to hatch.

**Parasites:** Nine snakes had nematodes (1-15) in their guts, one with 3 in the body cavity.

**Notes:** These snakes were common in the woodland and 24 of the specimens were collected in just 3 days. Males did not have active testes and it is not obvious why there should be such a large difference in the sex ratio of the specimens collected (23 males : 8 females). Brandstätter (1996) demonstrated that *P. phillipsii* is restricted to West Africa, and used *Psammophis* cf. *brevirostris tettensis* Peters (1882) as a replacement name for the olive grass snake. This was not a suitable combination as Broadley (1977) had demonstrated that the olive grass snake occurred in sympatry with *brevirostris*. Moreover, *Psammophis sibilans* var. *mossambica* Peters (1882) has page preference over *tettensis*. The correct available



name is thus *Psammophis mossambicus* (Branch 1998).

*Psammophis brevirostris leopardinus*

Bocage 1887

**Material examined:** PEM R6220-21, 6223-24, 6237, 6239 - Sakeji School, Northwestern Province (1124Ab); PEM R6222 - Sanolumba village, 46km northeast of Sakeji, south-eastern DRC (1124Ba): 2 males, largest 978(711+267)mm, 5 females, largest 1001(767+234 - tail tip truncated)mm. All with 17 midbody scale rows, ventrals 155 and 161 in males and 151-165 in females, subcaudals 81 (one specimen with a truncated tail) in males and 76 in 2 females. Olive green/brown dorsum with a distinct double yellow chain pattern, bordered with black. Ventrums light yellow, cream or even light green.

**Additional material:** PEM R967, 1979 - Mporokoso, Northern Province (0930Ac).

**Diet:** One male (PEM R6222) contained the remains of a ranid.

**Reproduction:** The males had mature testes and both females were gravid. PEM R6224 contained 14(8/6) ova (18.6x11.4mm) and R6220 with 11(6/5) ova (15.8x10.2mm).

**Note:** Two specimens (PEM R6237, 6239) were unusual, lacking the obvious chain pattern on the back and superficially resembling *P. mossambicus*; however, they had low ventral counts (152-154). The largest female (PEM R6224) exceeds the previous maximum SVL reported by Broadley (1977b). Brandstätter (1996) demonstrated that *P. sibilans* is restricted to north-east Africa. *P. brevirostris* thus becomes a full species, with *P. b. leopardinus* as a northern race. Brandstätter's (1996) distribution map of *P. b. leopardinus* shows an isolated population in northern Zambia, but overlooked Broadley's (1991a) description of material from the Mwinilunga District that bridges this gap.

*Rhamphiophis acutus acutus* (Günther 1888)

**Material examined:** PEM R6154-67 - Sakeji School, Northwestern Province (1124Ab): 9 males, largest 1006(831+175)mm, and 5 females, largest 703(567+136)mm. Ventrals 177-185 in males; 166-176 in females; subcaudals 59-66 in males, 53-62 in females; midbody scale rows: 17 (rarely 19) at neck, 17 (midbody) 13 (vent); pre-oculars 2, postoculars 2, temporals 2+3 (1+2 in PEM R6156); supralabials 8 (9 in PEM R6160) with 4th and 5th entering orbit;

infralabials 9 (10 in PEM R6158) with first 4 in contact with anterior sublinguals; anal divided.

**Diet:** One female (PEM R6154) had rodent hair in the stomach and hind gut; PEM R6167 contained grass. The remaining guts were empty.

**Reproduction:** All the males had mature testes and all 5 females were gravid. PEM R6167 was damaged when killed and the number or size and the ova could not be determined. The four remaining females had the following ova: 10(4/6) measuring 19.3x14.2mm; 13(7/6) measuring 12.3x10.7mm; 13(7/6) measuring 8.3x7.2mm; and 15(7/8) measuring 12.5x8.6mm.

**Parasites:** One male (PEM R6158) had a nematode in its gut.

**Note:** The Sakeji population clearly represents the typical race and not the subspecies *jappi* which was described from the Zambezi floodplains in western Zambia (Broadley, 1971b).

*Psammophylax tritaeniatatus* (Günther 1868)

**Material examined:** PEM R6149-51 - Sakeji School, Northwestern Province (1124Ab); PEM R6152 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba); PEM R7133 - Musenga town, 12km east of Chingola, Copper-belt Province (1227Db): 4 males, largest 661 (539+122)mm; 2 females, largest 611(492+119)mm. Ventrals 147-151 in males, 159 in both females; subcaudals 53-58 in males, 54-60 in females; supralabials 8 (4th and 5th entering orbit); infralabials 9 (first 4 in contact with anterior sublinguals).

**Additional material:** R1980 - Mbala, Northern Province (0831Cd).

**Reproduction:** The largest female (PEM R6149) contained 11(8/3) large ova (12.2x7.3mm) and the smaller female (252+46=298mm) contained 9(6/3) ova (2-3mm).

**Parasites:** One male (PEM R6152) had 5 nematodes in its stomach.

*Philothamnus hoplogaster* (Günther 1863)

**Material examined:** PEM R6186 - Sakeji School, Northwestern Province (1124Ab); PEM R12633 - Situnda Pan, Luiwa Plains National Park, Western Province (1422Da): 1 female, 441(309+132)mm; 1 male 671(480+191)mm. Ventrals 148-156, subcaudals 76-90; midbody scale rows 15, supralabials 7-8 (4th and 5th entering orbit); infralabials 9 (first 4 in contact with the anterior

sublinguals), cloacal divided, preocular 1; postoculars 2; temporals 1+1.

*Philothamnus heterolepidotus* (Günther 1863)

**Material examined:** PEM R6187 - Sakeji School, Northwestern Province (1124Ab): 1 male, 500 (372+128)mm, with 15 midbody scale rows, 174 ventrals and 98 subcaudals. Supralabials 9 (3th, 4th and 5th entering orbit); infralabials 9 (first 5 in contact with anterior sublinguals); preocular 1, postoculars 2, temporals 1+1.

*Philothamnus angolensis* Bocage 1882

**Material examined:** PEM R6190-92 - Sakeji School, Northwestern Province (1124Ab); PEM R7132, 8047, 8050, 10881-87 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db); PEM R6193-94 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 8 males, largest 992(658+334)mm; 5 females, largest 1034(728+306)mm; 2 juveniles, 1 measuring 508(356+152)mm. Midbody scale rows 15; ventrals 145-147 in males, 154-159 in female; subcaudals 101-108 in males, 93-99 in females; supralabials 9 (4th, 5th and 6th entering orbit); infralabials 10 (first 4-5 in contact with anterior sublinguals); preocular 1, post-ocular 2, temporals 1+1 (n=4) or 1+2 (n=1).

**Diet:** The stomach of a female (PEM R8047) contained a small (43mm TL) amphibian (*Bufo* sp. with tarsal fold); that of a young male (PEM R10884) contained a ranid; an adult male (PEM R10885) contained a large *Rana* (33.4gm), which comprised 26.1% of the snake's body weight.

**Reproduction:** Adult males had mature testes, measuring 23-28mm. All but one female were gravid; PEM R6194 had 9(5/4) eggs (21x8mm); PEM R10882 had 9(5/4) eggs (27.2x14.1mm); PEM R10883 had 17(9/8) eggs (28.2x15.1mm); whereas PEM R10887 had 12(7/5) eggs (26.4x14.8mm).

*Crotaphopeltis hotamboeia* (Laurenti 1768)

**Material examined:** PEM R6168 - Sonalumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba); PEM R7136, 8061-62 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db): 4 adult females, largest 546 (477+69)mm. Midbody scale rows 19, ventrals 156-163, subcaudals 34-39; supralabials 8 (3rd, 4th and 5th entering orbit), infralabials 9-11, preocular 1, postocular 2,

temporals 1+2. The supralabials in PEM R8061 were white in colour.

**Diet:** PEM R8061 contained the lower limbs of a large *Bufo* sp. (1.8gm); R8062 had the remains of a ranid in the stomach.

*Dipsadoboa shrevei shrevei* (Loveridge 1932)

**Material examined:** PEM R6153 - Sakeji School, Northwestern Province (1124Ab); PEM R7131, R8059-60 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db): 2 adult males, largest 1241(825+216)mm; 2 adult females, largest 1076(857+219)mm. Ventrals 206-207 in males, 211-212 in females, subcaudals 83-86 in males and 71-82 in females. Midbody scale rows 19, supralabials 8-9, (3rd, 4th and 5th entering orbit), infralabials 10-11 (first 5 in contact with the anterior sublinguals), preocular 1, postocular 2, temporals 1+2, anal entire. All specimens were a uniform black colour with a pale infusion to the throat.

**Diet:** One male (PEM R7131) contained a partially digested *Chamaeleo dilepis*; a male and female from Musenga both contained bird remains in their stomach and hind gut. PEM R8059 had a complete pied mannikin (*Spermestes fringilloides*) in the stomach.

**Reproduction:** The male had mature testes but the female had no enlarged ova.

**Notes:** Rasmussen (1985) recently elevated *shrevei* to a full species with *D. s. kageleri* as an East African endemic subspecies, known only from the Kilimanjaro Mountain rainforest. Both the largest male and female reported here exceed the maximum recorded sizes for the species (Rasmussen, 1985).

*Telescopus semiannulatus semiannulatus*

A Smith 1849

**Material examined:** PEM R11659 - Kafulafuta, Copperbelt Province (1328Bd): 1 young male measuring 402(331+71)mm, and 1 female measuring 714(592+122)mm. Overall yellow-brown colour with 35 dark transverse marking along the back. Scutellation: ventrals male 201, female 227; subcaudals male 69, female 62; anal divided.

**Additional material:** PEM R11649 - Isoka, Northern Province (1032Ba), E Knowles-Jordan.

**Reproduction:** The male's testes were flaccid and measured 12.9mm. The female contained several small ova measuring 2-3mm in diameter.



*Dispholidus typus* (A Smith 1829)

**Material examined:** PEM R6204-05, 6208-09 - Sakeji School, Northwestern Province (1124Ab); PEM R7126 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db); PEM R6203, 6206 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 3 adult males, 2 adult females and 1 juvenile. Largest male 1255(955+300)mm; largest female 1410(1070+340)mm. Midbody scale rows 19, ventrals 171-181 in males, 176-183 in females, 199 in a juvenile (PEM R6203); subcaudals 101-109 in males, 103-104 in females. The juvenile has typical *Thelotornis* type coloration on the body with white upper labials. Adult males are black with yellow spots on each dorsal and head shield, ventrum cream. One female (PEM R6206) had a pink/brown above, with a white throat and pinkish ventrum. The other female was a dull olive grey colour above and below.

**Diet:** The juvenile had the remains of a lizard *Chamaeleo* cf. *dilepis* in its stomach.

**Reproduction:** Males had mature testes; one female had no ova; another female (PEM R6206) contained 15 well-developed ova (32x17mm), and a large female (PEM R6208; 1070+355mm) had 18 (6/12) ova (31x18mm).

*Thelotornis oatesii* (Günther 1881)

**Material examined:** PEM R6195-98 - Sakeji School, Northwestern Province (1124Ab): 2 adult males, largest 1015(635+370)mm; 2 adult females, largest 1304(842+462)mm. Midbody scale rows 19; ventrals 158-164 in males, 144-168 in females; subcaudals 139-143 in males, 145-147 in females; cloacal divided; supralabials 8-9 (4th and 5th entering orbit); infralabials 11-12 (first 4 in contact with anterior sublinguals); preocular 1; postoculars 2-3; temporals 1+2. Top of head greenish with speckled pink and distinct Y-marking, labials white with black lining.

**Diet:** One gravid female (PEM R6197) contained a partially digested *Chamaeleo* cf. *dilepis* and a large grasshopper in the stomach, and enlarged ventrals from an unidentified snake in the hind gut. Another large female (PEM R6198) had scales from an unidentified skink in the hind gut. One adult male (PEM R6196) also contained the remains of a chameleon (*Chamaeleo* cf. *dilepis*) in the stomach, and scales and toes from a *Gerrhosaurus bulsi* (approx. SVL 90mm) in the hind gut. The other male (PEM R6195)

contained an adult male *Ichnotropis b. bivittata* (PEM R6280).

**Reproduction:** The males were mature, with large, though non-turgid testes, with thick coiled efferent ducts. All 3 females were gravid, containing 7-8 developing ova. The larger female (PEM R6198) had 8(5/3) ova (26.7x17.3mm); another large female (PEM R6196; 704+430mm) had 7(2/5) ova (16x5mm); PEM R6197 (760+440mm) also had 7(3/4) ova (17.3x6.8mm).

**Parasites:** A male (PEM R6196) had a nematode in the stomach. Simbotwe (1983) reported nematodes (*Abbreviata* sp.) from the stomach of a Lochinvar National Park (1527Cd) specimen.

**Notes:** One female (PEM R6198) is unusual in having a very low ventral count (144; usually >158), yet the rest of the scutellation is typical for the race (Broadley, 1966; 1983b). Broadley (1979) discussed the problems relating to the geographical variation within the genus, and recognized a number of races within *T. capensis*. He has recently proposed treating all races as full species (Broadley, pers. comm.). Shine *et al.* (1996) have discussed the unusually varied diet of this highly arboreal species. Foley (1998) gives further details of reproduction.

#### ATRACTASPIDIDAE: ATRACTASPIDINAE

*Atractaspis bibronii* A Smith 1849

**Material examined:** PEM R12494 - Chingola, Copperbelt Province (1227Bd): 1 adult female, 373(349+24)mm. Ventrals 241, subcaudals 21.

**Additional material:** PEM R1093, 1097 - Mbala, Northern Province (0831Cd), H Bredo; 2 juveniles.

**Notes:** The Chingola snake was killed after biting a child on the hand. The victim showed local swelling, intense pain with black-blue discoloration at bite site; pain killer (50mg Phethadine) and Phenergan were administered. The hand remained swollen and sensitive to touch, but this subsided after a week with small local necrosis at the bite site.

#### APARALLACTINAE

*Chilorhinothis gerardi* (Boulenger 1913)

**Additional material:** PEM R7244 - Lusaka, Central Province (1528Ad); PEM R7245 - Ndola, Central Province (1228Dc); PEM R7246 - Isoka, Northern Province (1032Ba), E Knowles collection: 3 adult specimens, the largest measuring 241(283+18)mm. Ventrals 279-285, subcaudals 24-26, supralabials 4 (followed by a



pseudo-supralabial which does not border the lip); infralabials 5 (first three in contact with anterior sublinguals).

## ELAPIDAE

*Elapsoidea guentheri* Bocage 1866

**Additional material:** PEM R1977 - Mbala, Northern Province (0831Cd), H Bredo: 1 adult female measuring 484(451+33)mm. Ventrals 141, subcaudals 18, supralabials 7 (3rd and 4th entering orbit); infralabials 7 (first three in contact with anterior sublinguals).

**Diet:** The stomach and hind gut held the remains of a large scorpion.

**Reproduction:** The female contained 10(7/3) ova, measuring 4.2x2.1mm.

**Notes:** Pitman (1934) reported a large female from Kabwe (1428Ad) with 10 eggs during January. The distribution of this species appears to be sporadic and it is currently known from only one locality in each of the Central, Northwestern, Copperbelt and Southern Provinces (Broadley, 1971a; 1971c). Mertens (1937) reported two hymenopteran larvae in a juvenile snake from Katanda (1625Dd).

*Naja annulifera* Peters 1854

**Additional material:** PEM R2367 - Livingstone, Southern Province (1725Dd): 1 adult male measuring 1579(1408+171)mm, tail truncated. Ventrals 182; dorsal scale rows 19, 19 and 15; supralabials 7 (3rd entering orbit); infralabials 8 (first 4 in contact with anterior sublinguals), postoculars 2, anal entire. Colour: uniform brown above and cream-grey ventrum.

**Diet:** The stomach was empty but there was rodent hair in the lower gut.

**Reproduction:** The testes were flaccid, measuring 39.6x6.9mm.

**Notes:** Broadley (1995) recently revived *annulifera* as a full species with *anchietae* as a western race. The specimen has neck and midbody scale counts typical of *N. annulifera*. However, two additional Livingstone specimens in the collections of the National Museums of Zimbabwe (Bulawayo) and Zambia (Livingstone) have 17 and 15 midbody scale rows, respectively, and are probably referable to *N. anchietae* (Broadley, pers. comm.). Together these specimens indicate sympatry between the sister species.

*Naja nigricollis* Reinhardt 1843

**Material examined:** PEM R6148 - Kwambali

school, Lake Mweru, 5 km S Nchelenge town, Luapula Province (0928Bc); PEM R7137, 8063 - 64 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db); PEM R9837 - Kafulafuta, Copperbelt Province (1328Bd): 4 males, largest 1479(1215+264)mm and 1 juvenile. Midbody scale rows 19, ventrals 179-184, subcaudals 61-65; supralabials 6 (3rd entering orbit); infralabials 8-9.

**Diet:** One male (PEM R8064) had a well-digested ranid in the stomach and mammal hair in the lower gut.

**Notes:** The southern and western races *nigricincta* and *woodi* are unlikely to be conspecific with *N. nigricollis* (Broadley, pers. comm.), which reverts to binomials.

*Naja melanoleuca* Hallowell 1857

**Additional material:** PEM R1151 - Mbala, Northern Province (0831Cd), H. Bredo. An adult male, 1559(1291+268)mm. Midbody scale rows 19, ventrals 207, subcaudals 64, supralabials 7 (3rd and 4th entering orbit), infralabials 7 (first four in contact with anterior sublinguals). Two distinct dark bands on the neck (on ventral count 13-18 and 24-29), colouration typical for *subfulva*.

**Reproduction:** The testes were flaccid, measuring 48.2x9.6mm.

**Note:** Broadley (1968) found large variation in both colour and ventral counts in the species, and rejected the retention of *subfulva* as a race.

*Dendroaspis polylepis* Günther 1864

**Material examined:** PEM R6188 - Sakeji School, Northwestern Province (1124Ab); PEM R6189 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 1 juvenile male, 936(734+202)mm, and 1 sub-adult female, 1396(1042+354)mm. Midbody scale rows 21; ventrals 266 in male, 277 in female; subcaudals 129 in male and 125 in female. Both a dull lead-grey colour dorsally with pale grey ventrum.

## VIPERIDAE: CAUSINAE

*Causus bilineatus* Boulenger 1905

**Material examined:** PEM R6170-71 - Sakeji School, Northwestern Province (1124Ab); PEM R6169 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 2 males, largest (PEM R6169) 354(318+46)mm; 1 adult female, 348(309+39)mm. Midbody scale rows 17 (with one exception of 18 in PEM R6171);

ventrals 136-138 in the males and 138 in the female; subcaudals 25-27 in the males and 26 in the female. Pale dorsolateral lines were distinct in all the specimens with clear dorsal black blotches (37-40 in males and 39 in the female). Ventral scales pale grey colour with black stippled anterior, usually more extensive at midbody.

**Parasites:** Stomach of male (PEM R6169) contained large numbers of nematodes.

**Reproduction:** The female was gravid and contained 8 eggs (5/3), measuring 14x8mm.

*Causus rhombeatus* (Lichtenstein 1823)

**Material examined:** PEM R6199, R6202 - Sakeji School, Northwestern Province (1124Ab); PEM R7127-29, R9535-36 - Musenga town, 12km east of Chingola, Copperbelt Province (1227Db); PEM R6200-01 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 5 males, largest 623(563+60)mm; 4 females, largest 701 (624+77)mm; 2 juveniles. Midbody scale rows 17-19; ventrals 136-145 in the males, 138-139 in the females; subcaudals 25-34 in the males and 26-27 in the female; supralabials 6; infralabials 9 (first 1 in contact with anterior sublinguals). Dorsal colours are pale grey with grey-black markings. Two of the snakes (PEM R7127 and R9535) had a pale grey ventrum, the other 2 had dark central ventra similar to *C. bilineatus*.

**Diet:** A female contained a slightly digested toad (*Bufo* cf. *gutturalis*) in the stomach.

**Reproduction:** A female (PEM R7127) contained 19(9/10) ova (9-11x5-6mm).

## VIPERINAE

*Bitis arietans arietans* (Merrem 1820)

**Material examined:** PEM R6210-13, 6216-19 - Sakeji School, Northwestern Province (1124Ab); PEM R6214 - 64km east of Mansa on Sampfya road, Luapula District (1129Ad); PEM R6215 - Sanolumba village, 46km north-east of Sakeji, south-eastern DRC (1124Ba): 8 males, largest 862(756+106)mm and 2 females, largest 491 (463+26)mm were examined. Ventrals 122-128 in the males and 128-129 in the females; subcaudals 23-28 in males and 13-15 in females. Four specimens had a black and golden yellow dorsal pattern, normally 6 chevrons and 6 blotches with 4 bars on the tail. PEM R7127 was a uniform grey colour with black chevrons; PEM R6214 a very light brown with dark brown chevrons. Two sub-adult snakes (PEM R6210-

11) were light brown with yellow borders on dark brown chevrons whereas the juveniles were all light brown with dark brown chevrons.

**Diet:** Only three guts were completely empty (one other snake was gutted). In three snakes the stomach was empty but the lower gut contained mammal hair. PEM R6219 had a total of 44gm (wet mass) of unidentified mammalian remains in stomach; PEM R6210 contained a small rodent in the gut (weight 4gm, swallowed tail first) and a large lump of mammal hair in the lower gut. Two other snakes had unidentified rodent remains in the stomach.

**Parasites:** Nematodes were collected in the stomach of male PEM R6218.

*Bitis gabonica*

*gabonica* (Duméril & Bibron 1854)

**Material examined:** PEM R6183 - Sakeji School, Northwestern Province (1124Ab); sight record (dry skin) - Lufwanyama farm, 28km east of Chingola, District Chingola, Copperbelt Province. The Sakeji specimen was an adult female, brought in after being killed in a forest fire. It was badly damaged, partly decomposed with posterior part of body missing. The specimen was skinned with midbody scale rows at 41. No ventral or subcaudal counts available because of damage to the body. Adult male measuring 1298(1151+147)mm, ventrals 129, subcaudals 28, midbody scale rows 41, supralabials 12; infralabials 17 (first four in contact with anterior sublinguals).

**Additional material:** PEM R2361 - Mbala, Northern Province (0831Cd).

**Diet:** The Mbala male had mammal hair in the hind gut.

**Notes:** A well-known snake in the Sakeji area. An adult was observed crossing the road on 15 July 1991 on the Hillwood farm near the school. A large adult was observed near the school swimming pool over several months (Brubacker, pers. comm.). As a result of extensive annual bush fires, these snakes are found mainly along the patches of evergreen forests along the streams, but are getting increasingly rare (Heygate, pers. comm.).

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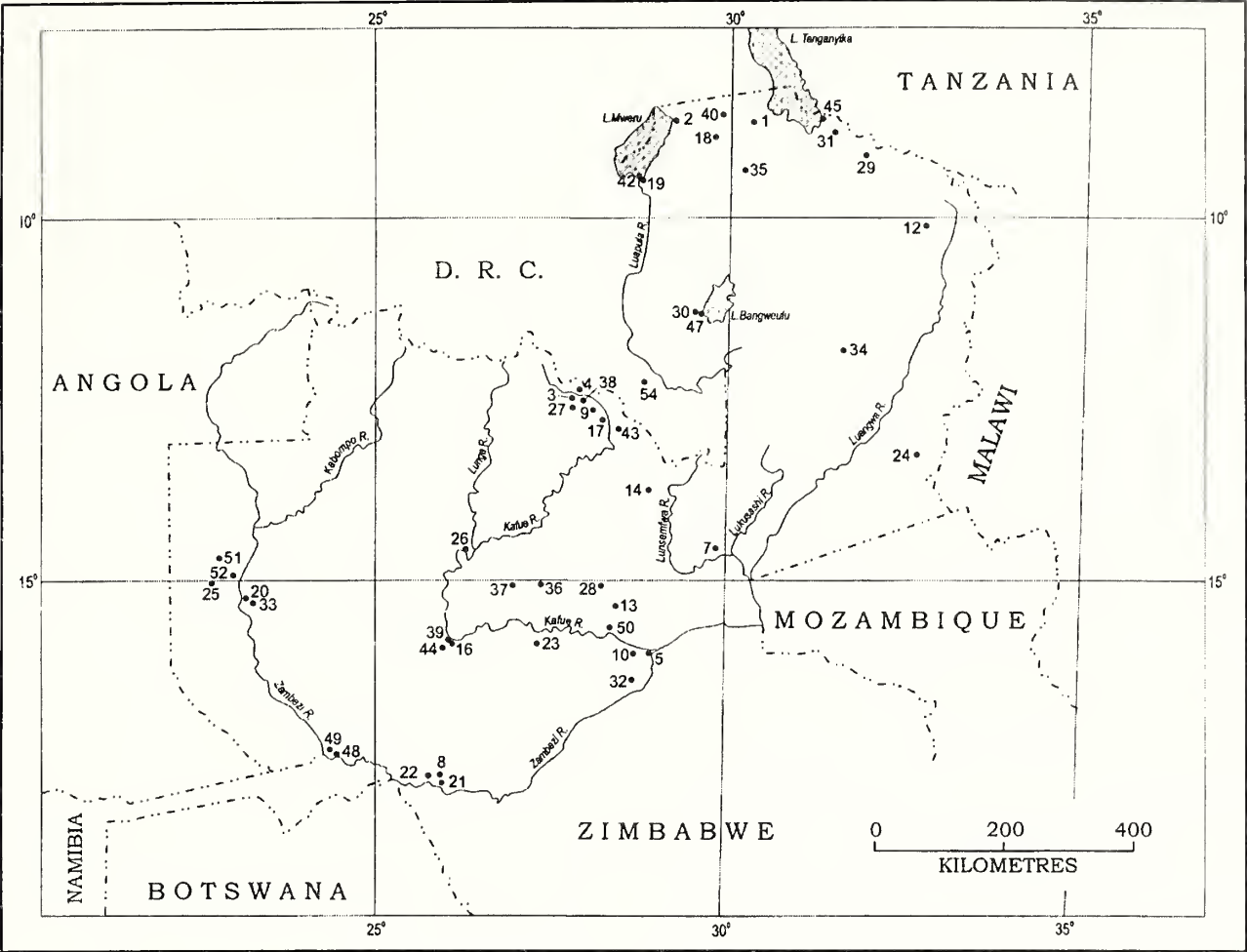
# APPENDIX 1: GAZATTEER OF LOCALITIES MENTIONED IN THE TEXT

LOCALITY	PROVINCE	GRID SQUARE	COORDINATES
<b>Zambia</b>			
1. Chansa (Masankwa Flats)	Northern	0830Ca	08°40'S, 30°12'E
2. Chiengi	Northern	0829Ca	08°38'S, 29°11'E
3. Chingola	Copperbelt	1227Bd	12°29'S, 27°47'E
4. Chililabombwe	Copperbelt	1227Bd	12°28'S, 27°51'E
5. Chirundu border post	Southern	1628Cc	16°02'S, 28°50'E
6. Chistenga River	Northwestern	1124Dd	11°45'S, 24°59'E
7. Chombe	Central	1429Db	14°36'S, 29°47'E
8. Dambwa Forest Reserve	Southern	1725Dd	17°46'S, 25°51'E
9. Farm 4304, District Chingola	Copperbelt	1227Db	12°37'S, 27°56'E
10. Gwabi Lodge, Kafue River	Southern	1528Dd	15°57'S, 28°49'E
11. Ikelenge	Northwestern	1124Ab	11°14'S, 24°15'E
12. Isoka	Northern	1032Ba	10°07'S, 32°41'E
13. Kabulonga, Lusaka	Central	1528Ad	15°22'S, 28°23'E
14. Kafulafuta	Copperbelt	1328Bd	13°48'S, 28°46'E
15. Kalala Lodge, Lake Itzhi-Tezhi	Central	1526Cc	15°46'S, 26°00'E
16. Kitwe	Copperbelt	1228Cc	12°52'S, 28°14'E
17. Lake Cheshi	Northern	0829Dd	08°56'S, 29°48'E
18. Lake Mweru	Luapula	0928Bc	09°26'S, 28°34'E
19. Lealui pontoon, Zambezi River	Western	1522Bb	15°12'S, 22°55'E
20. Livingstone	Southern	1725Dd	17°48'S, 25°51'E
21. Livingstone, 27km west	Western	1725Da	17°44'S, 25°36'E
22. Lochinvar National Park	Southern	1527Cd	15°56'S, 27°15'E
23. Luangwe East	Eastern	1332Ad	13°17'S, 32°27'E
24. Luanginga River, Kalabo town	Western	1422Dc	14°59'S, 22°40'E
25. Lufupa Camp, Kafue NP	Northwestern	1426Ca	14°36'S, 26°11'E
26. Lufwanyama Farm	Copperbelt	1227Da	12°37'S, 27°42'E
27. Lusaka	Central	1528Ad	15°10'S, 28°07'E
28. Mambwe	Northern	0931Bb	09°09'S, 31°52'E
29. Mansa, 64km east	Luapula	1129Ad	11°18'S, 29°24'E
30. Mbala	Northern	0831Cd	08°50'S, 31°24'E
31. Mbendele River	Southern	1628Bc	16°20'S, 28°41'E
32. Mongo	Western	1523Ac	15°15'S, 23°08'E
33. Mpika	Eastern	1131Cd	11°50'S, 31°31'E
34. Mpokoroso	Northern	0930Ac	09°22'S, 30°07'E
35. Mumbwa	Central	1527Ab	15°07'S, 27°21'E
36. Mumbwa, 13km west of town	Central	1526Bb	15°07'S, 26°56'E
37. Musenga	Copperbelt	1227Db	12°34'S, 27°53'E
38. Musungwa Lodge, Lake Itzhi-Tezhi	Central	1526Cc	15°46'S, 26°00'E
39. Mweru Wantipa	Northern	0829Db	08°37'S, 29°52'E
40. Mwinilunga	Northwestern	1124Cb	11°44'S, 24°25'E
41. Nchelenge	Luapula	0928Bc	09°25'S, 28°33'E
42. Ndola	Copperbelt	1228Cc	12°56'S, 28°10'E
43. Ngoma Camp, Kafue NP	Central	1525Dd	15°54'S, 25°57'E
44. Nyamkolo	Northern	0831Ca	08°40'S, 31°07'E
45. Sakeyi School	Northwestern	1124Ab	11°14'S, 24°19'E
46. Sampfya	Luapula	1129Bc	11°19'S, 29°31'E
47. Shesheke	Western	1724Cb	17°35'S, 24°25'E
48. Shesheke, 15km northwest	Western	1724Ad	17°26'S, 24°22'E
49. Shimbala	Central	1528Ca	15°41'S, 28°16'E
50. Situnda Pan, Luiwa Plains NP	Western	1422Da	14°40'S, 22°39'E
51. Siyenge pan, Luiwa Plains NP	Western	1422Dd	14°48'S, 22°55'E
52. Zambezi rapids	Northwestern	1124Aa	11°07'S, 24°08'E



# Democratic Republic of the Congo

53. 32km NE Mufilira	Shaba	1228Ba	12°13'S, 28°42'E
54. Sanolumba village	Shaba	1124Ba	11°12'S, 24°30'E



**Figure 2.** Map of Zambia with localities listed above.

# INDIGENOUS PLANT USE OF THE AMAXHOSA PEOPLE ON THE EASTERN BORDER OF THE GREAT FISH RIVER RESERVE, EASTERN CAPE

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## ABSTRACT

The use of indigenous and some naturalised exotic plant species by Xhosa-speaking people in nine villages in the former Ciskei is documented and summarised in a table of 83 plant species. Plant use and indigenous knowledge was recorded over a two year period culminating in an intensive four week study to confirm and clarify data. Eight case studies based on the principles of Participatory Rural Appraisal (PRA) were undertaken with 87 informants. Sixty-one percent of the total number of plant species recorded were used for medicinal purposes, 7% for customs and cultural purposes, 18% for food and the remaining 14% for fuel, construction and veterinary purposes. Species are ranked according to degree of importance and perceived abundance by user groups.

**Keywords:** Ethnobotany, amaXhosa, Eastern Cape

## INTRODUCTION

Much is known about the floristic and faunistic composition of the Great Fish River Reserve Complex (Dyer, 1937; Palmer, 1981; Everard, 1987; Hoffman & Everard, 1987; Palmer, 1988; Palmer, Crook & Lubke, 1988; Palmer & Avis, 1994; Evans, Avis & Palmer, 1997) and its surroundings, although very little published information exists on the use of plants by the amaXhosa people of the area (Cocks, 1996; Dold & Cocks, 1997). It is evident from the many successful amaYeza stores (Xhosa pharmacies) in the Peddie and King William's Town districts (Cocks, 1996) that there is a substantial trade in wild harvested plant material. Many people in these areas collect and use plant material for their own use. A rich and diverse cultural knowledge has been passed down orally since the 18th century and in areas of abject poverty is still relied on to sustain a certain quality of life. The diverse and restricted flora of the area is unique thus exhibiting unique plant use by the local communities.

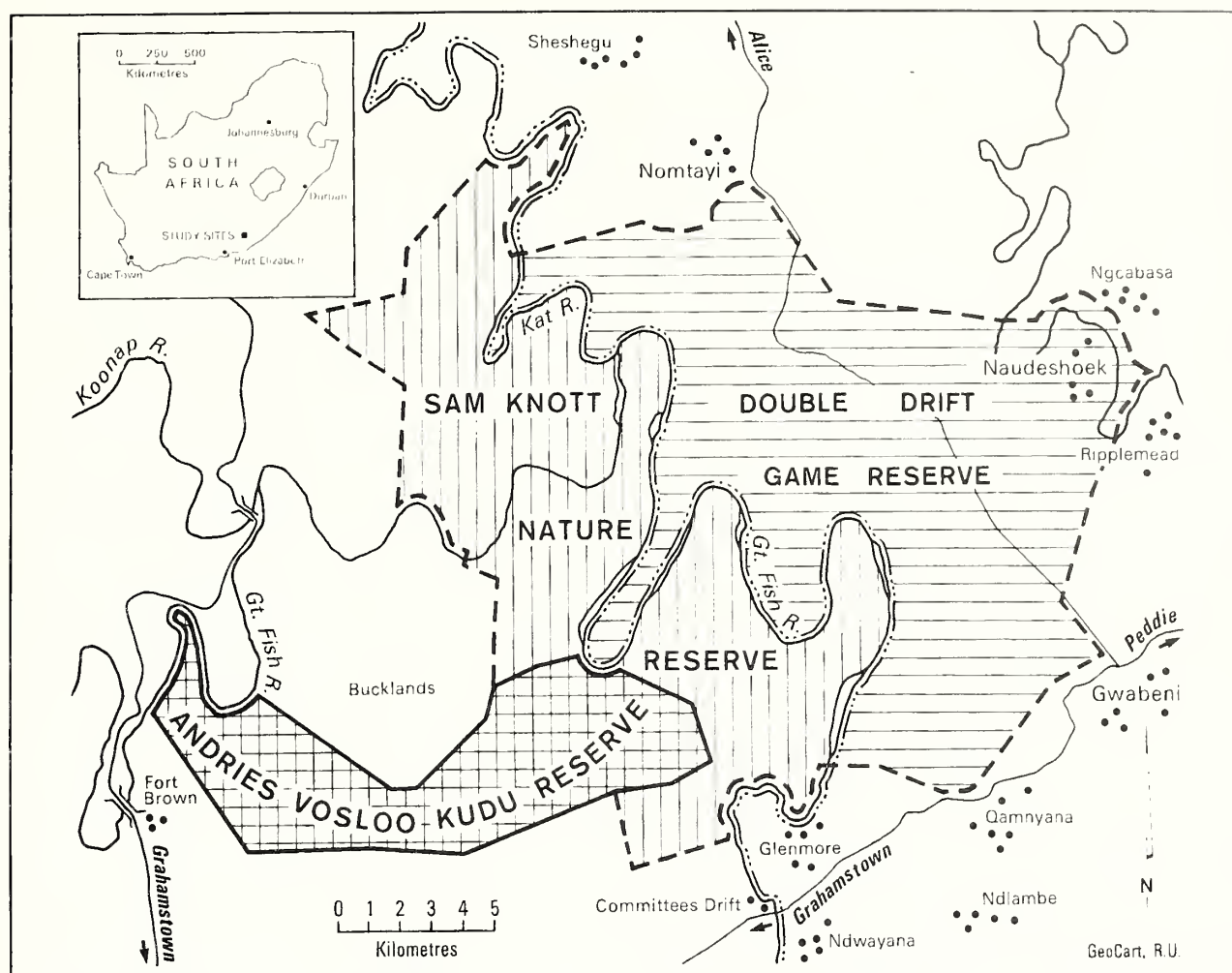
A study of the trade in plant material and products in the Peddie and King William's Town Districts revealed that a substantial quantity of wild harvested plants are sourced in the current study area (Cocks, 1996) resulting in a need to

assess these resources. A report on ethnobotanical resources was undertaken (Cocks & Dold, 1997) confirming this to be an area of high harvesting intensity both locally and by commercial gatherers from as far afield as Gauteng. The aim of this paper is to document species specific plant use at a household level in the same study area and to assess the degree of importance of these to users. Perceived abundance and accessibility of species is recorded with regard to both communal land and restricted reserve land.

## THE STUDY AREA

The Great Fish River Reserve complex (Double Drift, Sam Knott and Andries Vosloo reserves) is situated 40km North-East of Grahamstown in the Eastern Cape (Fig.1). The study area lies between 33°00' and 33°09' S and 26°37' and 26°55' E. The vegetation type is the Fish River Scrub category of Acock's (1988) Valley Bushveld. In its undamaged state it is an extremely dense, semi-succulent thorny scrub, about 2m high, however, due to overgrazing it has been opened up and invaded by the prickly pear (*Opuntia ficus-indica*) and colonised by *Pteronia incana*. Palmer (1981) recognises 13 plant communities ranging from dwarf shrubland





**Figure 1.** The Great Fish River Reserve Complex

characterised by the *Felicia fascicularis* - *Walafrida geniculata* association, through the succulent bushclump savanna of the *Portulacaria afra* - *Ruellia cordata* association to the woodland of the southern slopes characterised by the *Hippobromus pauciflorus* - *Schotia latifolia* association. The vegetation comprises a mosaic of bushclumps and grasslands, with as many as 18 woody species occurring in one bushclump. This succulent thicket type is restricted to the immediate Fish River Valley area. The introduction of large numbers of goats and cattle has resulted in overgrazing and degradation of the vegetation, which is characterised by a reduction in total plant cover and a loss of endemic species, particularly succulents and bulbous plants (Kerley, 1996). It has been found that 16.3% of plants recorded for medicinal purposes in the study area fall into these life form categories. According to the publication Nakor (1981) only 1.2% of the total extent of Valley Bushveld is currently conserved.

Geologically the area comprises the Middleton formation which consists predominantly of grey and red mudstone and sandstone. The climate may be described as warm temperate and the mean annual rainfall is 434mm, with peaks in October and March (Palmer, 1988).

There are nine villages adjoining the reserve on its eastern boundary (former Ciskei), and of these six were included in the study: Nomtayi, Ripplemead, Tweni, Ndwayana, Glenmore and Gwabeni. (Fig.1). Double Drift Reserve was also visited and data collected from eight game guards employed by East Cape Nature Conservation. A culturally important site at Fort Montgomery was visited. The villages represent the entire eastern boundary of the reserve. Most of this area consists of communal land where little control exists over grazing and other forms of resource use. The human population density is approximately 70 people per square kilometre, with an unemployment rate of more than 70%, resulting in a local economy based on state pensions and subsistence farming.

Stocking rates are estimated to be three to five times the recommended rate (Ainslie, *et al.*, 1994). A large number of inhabitants rely on natural resources for fuel, building material, medicines and to a lesser extent food and income through resale.

An historical and socio-political overview of the Great Fish River Reserve Complex can be found in Webley's (1997) Eastern Cape Cultural Resources Management Pilot Project on the Great Fish River Reserve. However, it is important to note here that the amaXhosa people inhabiting the area are the descendants of amaXhosa, and to some extent Khoekhoen and San, that have been in the area since the late 18th century (Webley, 1997) and thus have an inherent knowledge of the natural environment, i.e. the Valley Bushveld (Acocks, 1988).

### METHODOLOGY

A participatory approach to data gathering was selected based on Participatory Rural Appraisal (PRA) principles. PRA can best be defined as an approach and method for learning about rural life and conditions from, with, and by rural people (Chambers, 1994), and a way of interacting with villagers, understanding them and learning from them (Mukherjee, 1993). These methods enable us to unravel the complex interactions between people and plants. PRA methods also assist in overcoming obvious flaws that arise as a result of inappropriate methods and ignorance. For example, traditional extractive methods frequently treat resource users in communities as homogenous groups with the same levels of knowledge despite the fact that specific groups and individuals use available resources in different and various ways that depend on experience, gender, age or specialist knowledge. Such differences are often overlooked and not recorded (Cunningham, 1994). PRA methods provide the means to capture this valuable information by means of recognizing the various perceptions.

Six village communities in the study area were visited and informants included men and women of different social standing, as well as children, in order to involve custodians of different cultural information (Fig.4). The process included informal group discussions with various interest groups as well as interviews with individuals with more specialized knowledge. In most cases an interpreter was em-

ployed (an individual from the group) who acted as a co-facilitator. Information gathered through PRA exercises is summarized in Table 2.

### PRA METHODS

#### 1. Transect walks

Transect walks, also known as "walk-in-the-woods interviews" (Alexiades, 1996) involve systematically walking through an area with key informants discussing and recording various aspects of resource use with them. The value of such an exercise to the study was to collect information about local plant use and to collect specimens referred to at the same time. From a botanical perspective it is essential that all information gathered is linked to voucher specimens (Croom, 1983).

Four transect walks were undertaken (Table 2) in three villages. Specimens were collected with detailed information about the uses and preparation of each. Informants for the transect walks were selected from various groups such as men, women, youths and specialists such as traditional healers. On each walk no more than three informants were selected because of the difficulties of recording the information. The transect walks were undertaken through the main collecting and harvesting areas identified by the informants. Informants were encouraged to point out plant species that they recognized and to provide the vernacular names, use and preparation of each, as well as any other information they may have.

A duplicate set of specimens was collected, one set for the PRA exercises performed in the discussion groups and the other set to be pressed and as voucher specimens to be housed in the Selmar Schonland Herbarium at the Albany Museum.

#### 2. Mapping exercise

Two mapping exercises with five participants (Table 2) were undertaken to access information relevant to the source and accessibility of plant resources. Mapping involves the drawing of simple schematic maps by local informants. The groups were provided with large pieces of strong blank paper and felt tipped marker pens in a range of colours. The participants were asked to draw their village in relation to the resource collection points and landmarks such as rivers and mountains. Once the maps were completed discussion amongst the group was



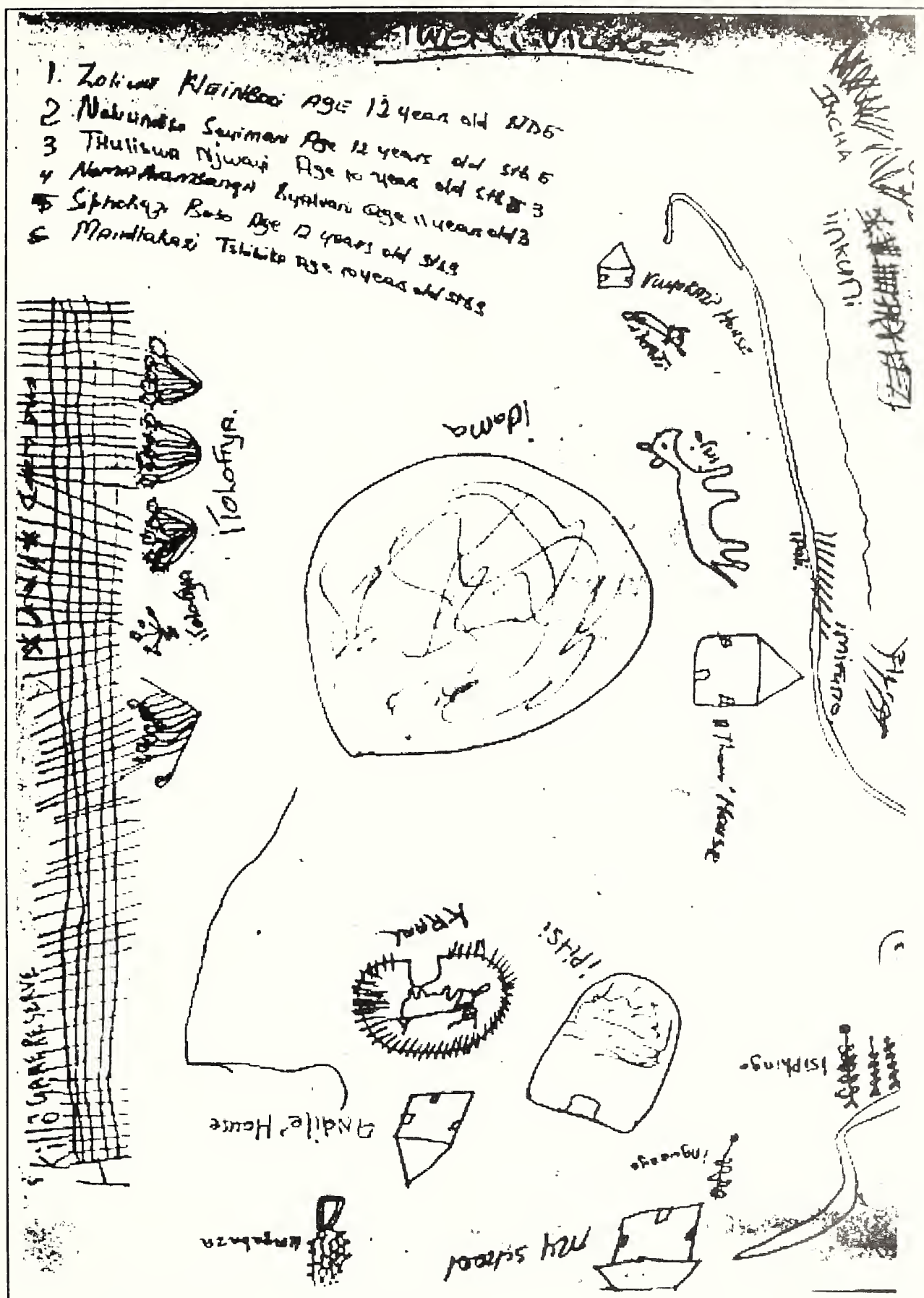


Figure 2. Map drawn by Tweni villagers

encouraged to determine which plants should be drawn on the map and therefore to provide an indication of priority and importance of the plants selected. The positioning of the plant species in relation to the village indicated the distribution and estimated distances covered to collect them, thereby attaching value to each plant.

Mapping exercises were undertaken in two villages, providing information regarding resource localities and abundance. Both exercises revealed that fuel wood and construction material are in great demand and difficult to access. From the example (Fig.2) it was shown that these, and other resources, are perceived to be abundant, but inaccessible, in the reserve (fence indicated by heavy cross hatching on the maps).

### 3. Informal discussion groups

Three informal discussion groups were undertaken (Table 2) in three villages with 31 informants, resulting in detailed information of 52 plant species. Information gathered in transect walks was verified and added to. During the discussion the duplicate set of plant specimens collected in the transect walks was displayed to prompt the discussion. One specimen was shown at a time and discussed. Participants were encouraged to respond to the following questions:

- ▶ Do they recognise/know the plant, if so by what name do they know it?
- ▶ What do they use it for?
- ▶ How is it used?
- ▶ Who uses it (adults, children, men, women)?
- ▶ How is it prepared?
- ▶ Is it bought or sold?
- ▶ Where is it collected?
- ▶ How plentiful is it?
- ▶ Can something else be used as a substitute? (indicating importance/value)

This technique provided the means to verify previously collected information and to collect further uses of the plants from a large number of people at one time. The results indicated the level of knowledge and the extent and intensity of plant use within the communities.

### 4. Ranking exercises

Two ranking exercises (Table 2) were undertaken with 10 informants each in two villages. Ranking and scoring exercises reveal priorities

and preferences by allowing informants to physically rank and re-rank specimens and give reasons for doing so (Mukherjee, 1993). Plant species were attributed a status or value by means of ranking representative specimens according to importance, abundance and quantity used.

To conduct the exercise three squares of obviously varying sizes were drawn and each designated a value relative to its size, i.e. most important, less important and least important. The participants were asked to place each specimen (collected previously in the transect walk exercise) into a square, thereby assigning it to that particular category. Reasons for the decision were discussed and recorded for each specimen. Each group was presented with the same plant specimens, to standardize the data source and allow for the accurate interpretation of the results.

Plant species previously identified as important in transect walks and discussion groups were ranked so as to ascertain the most important and most commonly used. The results are summarized in Table 1.

### 5. Semi-structured interviews

Two semi-structured interviews were undertaken in two villages (Table 2) with seven informants. The advantage of such an interview is that it is based on a partly structured guide but at the same time has the flexibility of an unstructured interview (Alexiades, 1996). This makes it possible to collect comparable, quantitative data while at the same time probing into new areas of interest which might arise in the interview. The interviews were conducted in an informal manner and in a relaxed setting whereby queries emerge from the responses received. The predetermined topics discussed in the interviews related to demand and accessibility of fuel wood, culturally useful plants and medicinal plants.

The results of the interviews revealed very definite cultural use of individual species. Regarding the reserve complex it is clear that access to natural resources is desired by all neighbouring communities.

### 6. Interviews with key informants

Four key informant interviews were undertaken (Table 2) with nine informants to further clarify two issues: Culturally useful plants and demand and accessibility of fuel wood. The key



**Table 1.** Plant species most commonly used and designated most important.

Plant species ranked	Most commonly used (in order)	Most important (in order)
<i>Aloe ferox</i> <i>Asparagus africanus</i> <i>Asparagus suaveolens</i> <i>Boscia oleoides</i> <i>Cadaba aphylla</i> <i>Capparis sepiaria</i> <i>Capparis fascicularis</i> <i>Cissampelos capensis</i> <i>Clausena anisata</i> <i>Cotyledon orbiculata</i> <i>Dianthus thunbergii</i> <i>Dioscorea sylvatica</i> <i>Gasteria bicolor</i> <i>Haemanthus albiflos</i> <i>Haworthia attenuata</i> <i>Leucas capensis</i> <i>Olea europaea</i> subsp <i>africana</i> <i>Plumbago auriculata</i> <i>Polygala myrtifolia</i> <i>Polystachya pubescens</i> <i>Ptaeroxylon obliquum</i> <i>Pteronia incana</i> <i>Sansevieria hyacinthoides</i> <i>Solanum nigrum</i>	1. <i>Olea europaea</i> subsp <i>africana</i> (cultural) 2. <i>Ptaeroxylon obliquum</i> (cultural) 3. <i>Gasteria bicolor</i> (cultural & medicinal) 4. <i>Haworthia attenuata</i> (cultural & medicinal) 5. <i>Cissampelos capensis</i> (medicinal)	1. <i>Olea europaea</i> subsp <i>africana</i> (cultural) 2. <i>Ptaeroxylon obliquum</i> (cultural) 3. <i>Plumbago auriculata</i> (cultural) 4. <i>Clausena anisata</i> (medicinal)

informants were interviewed with the explicit aim of recording their particular knowledge and requirements. The key informants were recognized during the group discussions and requested to participate in more detailed individual interviews.

**RESULTS**

A total number of 83 plants was collected and the plants are listed in Appendix 1. Many of these have multiple uses and the uses, preparation and administration for each have been recorded. Only a single species, *Encephalartos altensteinii* (vulnerable), has a documented conservation status (Hilton-Taylor 1996).

Sixty-one percent of plant species recorded represented medicinal plants (Fig.3) and these are listed in Appendix 1. A host of medicines for minor complaints (22 complaints) were recorded and these, unlike those for more serious problems, often varied from person to person. In discussion groups these were sometimes only known by a single person while another knew a different plant remedy for the same ailment. For more serious problems it was found that according to Xhosa custom the first recourse

to remedy would be to counteract evil, because misfortune is often caused by witchcraft or sorcery. Thirty percent of the medicinal plants recorded are for washing (*iYezalokuhlamba*), spraying (*ukuTshiza*), fumigating (*ukuXhotha*) and steaming (*ukuFutha*) as counteractive and protective medicines. These medicines are used mainly for their psychoactive virtues and are generically known as *iNtelezi* medicines. Current literature often categorises these as magical (Pujol, 1993) or as charms (Soga, 1931; Broster, 1981). In the study site these include *Bulbine latifolia* (*iRooiwater*), *Dianthus thunbergii* (*uBulawu*), *Dioscorea sylvatica* (*iSkorpathi*), *Haworthia attenuata* (*iNtelezi*), *Ledebouria revoluta* (*iKreketsane*), *Plumbago auriculata* (*iChinchini*), *Schotia latifolia* (*uMaphipha*) and *Gasteria bicolor* (*iNtelezi*).

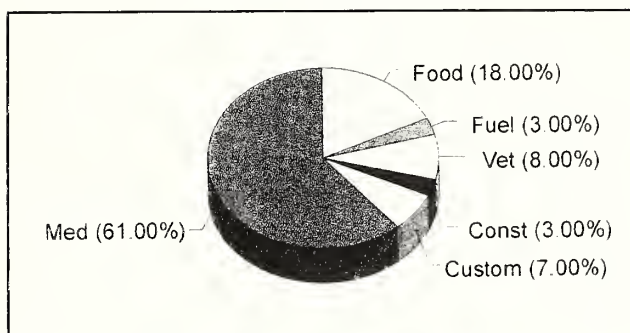
Various preparation methods and methods of application of medicines were recorded. Forty-five percent of the total number of preparations were infusions in hot or cold water taken orally, 14% used as an enema, 14% as a body wash, 12% as an emetic and the remaining 15% snuffs, ear drops, poultices, douches, gargles and lozenges. Medicine to purge or clean the

**Table 2:** Summary of information collected from the PRA exercises

Village	Transect walk	Mapping exercise	Informal discussion group	Ranking exercise	Semi-structured interview	Key informant interview
Nomtayi	1 informant: 21 spp. collected	15 informants: medicinal & food plants commonly collected around village; fuel and construction materials uncommon, collected at great distances from within reserve.	17 informants : 20 spp. recorded for personal use.		5 informants: fuel wood scarce, collected opportunistically without sp. selection; thatching grass not favoured; commercial building poles purchased	1 informant: Harvests fuel wood and food spp. for family in Peddie.
Ripplemead					2 informants: 1 cultural sp; 1 medicinal sp.	6 informants: 3 spp. of cultural (spiritual) importance. 1 informant: harvesting and trading at national level.
Double Drift			7 informants; 21 spp. harvested for personal use & trade.			
Tweni	1 informant: 38 spp. collected. 2 informants: 18 spp. collected	15 informants: fuel wood rare, supplemented with cow dung.	7 informants: 12 spp. for personal use.			
Ndwayana				5 informants: 22 spp., 2 spp. critical, 9 spp. very important.		
Gwabeni	2 informants: 27 spp. collected					
Fort Montgomery						1 informant: cultural artifact (raintree)
Glenmore				5 informants: 22 spp.; 2 critical, 12 important.		



body is a common health practice among Africans and it has been well recorded in the literature (Pujol, 1993, Leclerc-Madlala, 1994). They are either used routinely as a type of preventive health measure or with the onset of any symptoms of illness. The African world view is that illness is commonly attributed to either natural or supernatural causes with the idea of "contamination" entering from both the physical and the spiritual plane. It is believed that a cure or relief is only to be found through purging and cleansing the body. Therefore purging in all its forms is usually the first course of action in the quest for a cure for any and all



**Figure 3.** Plant use categories

illness (Leclerc-Madlala, 1994). Plant species recorded more than once for purging are *Aloe ferox* (iKhala), *Bulbine frutescens* (iYakayakana), *Cissampelos capensis* (uMayisake), *Dianthus thunbergii* (uBulawu), *Dioscorea sylvatica* (iSkorpathi), *Haemanthus albiflos* (uMaweni), *Haworthia attenuata* (iNtelezi), *Kedrostis foetidissima* (iThuvish), *Polygala myrtifolia* (uMabalabala), *Sansevieria thyrsiflora* (iKolokoto), *Solanum incanum* (uMathuma) and *Urginea altissima* (uZabokwe).

Seven percent of plant species recorded were used for Xhosa customs and rituals (Fig.3). The two most important and commonly used plants in the study area are *Olea europaea* subsp. *africana* (uMnquma) and *Ptaeroxylon obliquum* (uMthathi). Both are used in ceremonies where animals are ritually slaughtered, the meat is then laid out using a bed of leaves and branches as a large plate (Dold & Cocks, 1999). *Dianthus thunbergii* (uBulawu) is used to produce foam in water (saponin) for ritual purposes. Both *Plumbago auriculata* (iChinchin) and *Carissa bispinosa* (iNcumncum) are used to make ritual staffs by diviners. *Cadaba aphylla* (iStorom) is planted around the home to ward off lightning and evil spirits. A pair of *Euphorbia*

*triangularis* (uMhlontlo) seedlings are customarily planted near the entrance to a homestead when twins are born. *Clausena anisata* (iPerepes) and *Boscia oleoides* (iVetrhathi) are burnt and the smoke is blown around a new born baby as an incense to ward off evil spirits at this vulnerable time. *Haworthia attenuata* (iNtelezi) is planted around the home to intercept evil spirits and protect it from lightning.

A site specific cultural tree, *Sideroxylon inerme* (uMqwashu), was visited and its use documented. As far as we have been able to ascertain this "Rain Tree" that is called upon to evoke rain in times of drought, has not been previously documented. Appendix 2 provides details in the form of a case study.

Food plants accounted for 18% of plants recorded (Fig.3). Fruits are only occasionally eaten and not collected as a staple food. The following fruits are eaten: *Capparis fascicularis* (iNtshila), *Carissa bispinosa* (iNcumncum), *Ehretia rigida* (uMhlehi), *Grewia occidentalis* (iNgabaza), *Harpephyllum caffrum* (iNgwenye), *Pappea capensis* (iLitye) and *Scutia myrtina* (iSipingo). The leaves of *Portulacaria afra* (iGwanishe) and the tap root of *Gazania krebsiana* (iNongwe) are occasionally eaten as a thirst quencher or snack. Wild vegetables, indigenous and exotic ruderals, are collected regularly as a supplement to the staple diet of maize and are known generically as iMifino plants. Woman and young girls collect the leaves of *Solanum nigrum* (iSobosobo), *Sonchus asper* (iHlaba), *Marrubium vulgare* (iMbuya), *Arctotis arctotoides* (iSkwamba) and *Taraxacum officinale* (iHlaba) daily. The dietary value of iMifino plants are documented by Rose & Jacot Guillarmod (1974) and Mbangata *et al.* (1984). Plants seldom eaten but known to be used in drought periods as a source of water are *Cussonia spicata* (uMsenge) and *Cotyledon orbiculata* (iSundu). The fruit of the invader plant *Opuntia ficus-indica* (iTolofiya) is collected in season both as a food supplement and to be sold to passing travellers. This activity is well documented by Brutsch & Zimmermann (1993).

In a traditionally pastoral culture it is not surprising that 8% of plant use records are for veterinary medicines. *Haemanthus albiflos* (uMathunga), *Asparagus* sp. (uMathunga) and *Acacia karroo* (uMnga) are used in poultice form to heal broken limbs of goats and cattle. An infusion of *Azima tetracantha* in cold water (iGcegceleya) is given to animals experiencing delivery problems and *Sarcostemma viminalis*

(*uMbelebele*) is dried, powdered and given to animals to encourage lactation. *Secamone filiformis* (*uMbijela*) and *Arctotis arctotoides* (*uBhushwa*) are given to animals suffering from a disease that causes weakness and grogginess. *Aloe ferox* (*iKhala*) leaves are boiled in water and the liquid added to cattle drinking water to prevent redwater disease, the same is added to poultry drinking water to prevent poultry disease.

Poles used for the construction of dwellings and cattle kraals are scarce and the main criteria for their selection are size and straightness. In the study site species used include *Combretum caffrum* (*iDube*) for huts and *Acacia karroo* (*uMnga*) for kraals. Commercially grown poles are bought in Alice and King William's Town. The construction of a traditional Xhosa hut is documented by Johnson (1982). Live kraal fences are often cultivated from cuttings of *Portulacaria afra* (*iGwanishe*). *Rhoicissus digitata* (*uMqceba*) is used for rope.

It has been documented by Briers and Powell (1996) that *Euclea undulata* is selected by commercial collectors in the Valley Bushveld but that wood selected for private use is collected less selectively. Villages in the study site are not supplied with electricity and are reliant on fuel wood although this is often scarce and supplemented with dried cow dung collected by children. Fuel wood is collected opportunistically by woman and young girls where available without regard to specific species selection, however, *Acacia karroo* (*uMnga*) and *Putterlickia pyracantha* (*uMqha-qoba*) are reported to be good fuel woods. *Ptaeroxylon obliquum* (*uMthathi*) is used as a firelighter. Fuel wood accounts for the largest mass of plant material taken from the study site.

Exotic plants that have been introduced and naturalised are very often used not only as *amaYeza* but also as *iMifino*, a generic term for wild vegetables. Eleven useful exotic plant species were recorded. Food plants include *Opuntia ficus-indica* (*iTolofiya*), *Solanum nigrum* (*iSobosobo*), *Sonchus asper* (*iHlaba*) and *Taraxacum officinale* (*iHlaba*). The use and value of these in the former Transkei is discussed by Mbangata *et al.* (1984). The fruit of *Solanum incanum* (*uMathuma*) is pulped and applied to ringworm and an infusion of the root is used to treat kidney pain. An infusion of the leaves of *Schinus molle* (*iPepile*) is taken for influenza and fever. *Nicotiana glauca* (*iCubamfene*) leaves are

heated and applied as a poultice to boils. A cold infusion of the bark of *Catharanthus roseus* (*iFlawa*) is taken to treat diabetes (*iSwekile*). Sap of *Ruta graveolens* (*iVentrit*) is added to milk and given to infants with wind. An infusion of the leaves of *Malva parviflora* (*iJongilanga*) is used as a gargle to treat toothache. Small pieces of fresh bark of *Withania somnifera* (*uBuvimba*) are chewed raw to treat chronic coughing.

All of the major contributors except one, a trained diviner, had learnt *amaYeza*<sup>1</sup> use from an elder in the family. This information is not written down but passed on from one generation to the next by way of experience. The diviner had accessed her knowledge from her ancestors by way of dreams. It is encouraging to have seen that many young people, particularly girls, have in turn learnt *amaYeza esiXhosa* (Xhosa medicine) from their elders. Xhosa customs (*amaSiko esiXhosa*) are still strongly adhered to in the study site by young people although these have been adapted and changed with the times and are often very different from *iQobo lesiko lesiXhosa* (strongly traditional).

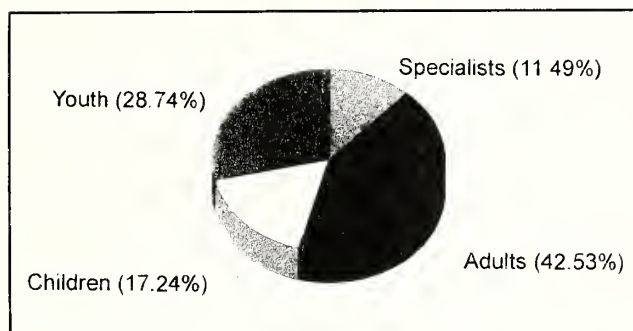
Methods of plant identification proved to be unconventional and innovative. In contrast to using comparative methods collectors used a combination of the senses. The process involves sight, touch, smell, and taste. *Cassine papillosa* (*uMbomvana*) was identified by slashing the bark to reveal a deep yellow under surface, *iThuvish* (*Kedrostis foetidum*) was smelt and as the name implies has a repulsive smell, and *uMqeba* (*Brachylaena illicifolia*) was recognised by its bitter, astringent taste. Names of plants very often stem from usage (Dold & Cocks, in press). For example, *iYezalamasi* (*Senecio coronatus*) means "medicine of milk" and is used in weaning a child from its mother's milk, and *iYeza-lokuhlamba*, means "medicine for wash-ing" (many species) and is used as a body wash to ensure good fortune and eliminate evil. *Haemanthus albiflos* is known as *uMathunga*, meaning "to sew", and is used to speed up the healing of broken bones. Names also originate from the appearance of the plant such as *iSibindi*, (*Pycnoporus cinnabarinus*), meaning

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<sup>1</sup> It should be noted that the word *iyeza* not only encompasses curative and preventative medicine for bodily ailments but includes substances used in *amasiko*, meaning culturally related customs and rituals.



“liver”. This is a dull red bracket fungus that looks remarkably like liver. Another example is *iSkolpati*, from the Afrikaans *skilpad* meaning tortoise, *Dioscorea sylvatica*, which has a tuber that closely resembles a tortoise on the ground. The name *iJongilanga*, meaning “looking at the sun”, applies to *Malva parviflora* owing to its perceived habit of the leaves following the path of the sun.



**Figure 4.** Informant categories

Several plants have some resemblance to some ‘portion’ of the body and through association are used as healing agents for those affected parts. This is referred to as the “Doctrine of Signatures” (Pujol, 1993) and is well documented in Europe. In the study area examples include: *Acacia karroo* - the red inner bark is used to treat bloody stools; *Catharanthus roseus* - the red inner bark is used to treat diabetes; *Pelargonium reniforme* - the bright red fleshy root is used to treat bloody stools. *Sarcostemma viminalis* - the stems with copious milky latex are used to encourage lactation in cows.

Mapping exercises showed that villagers perceived the reserve complex to be a large untapped although inaccessible source of natural resources. Female informants prioritised fuel wood and construction materials whereas male informants prioritised grazing and browsing for their stock as the most sought after resources from within the reserve complex. The recently established (1995) Inxuba Conservation and Economic Forum (ICEF),

representing all villages neighbouring the reserve complex, is negotiating with reserve authorities regarding possible controlled access to reserve resources (Cocks & Timmermans, 1999).

## CONCLUSION

It is clear from this study that medicinal plants, food plants and plants used for culturally related purposes are widely known and regularly used by communities in the study area (Fig.4). These are collected by the users themselves and the level of botanical knowledge at the household level is far greater than has been previously attributed in relevant literature (Cocks, 1997). Eighty percent of plants recorded had their names and uses confirmed two or three times by different informants. Contrary to expectations it is not only *amaQhaba*, (traditionalists) who use these plants but people from all age groups, religious affiliations, and levels of education. Users ranged from teenagers to old-age pensioners, from rural subsistence farmers to wealthy urban businessmen.

Eighty-three plant species with uses, preparations and vernacular names are listed together with their perceived abundance and accessibility. *Olea europaea* subsp. *africana* is ranked as the most important plant, followed by *Ptaeroxylon obliquum*. Both species are used regularly for cultural practices at a household level in the study site. The most commonly used plants are *Olea europaea* subsp. *africana*, *Ptaeroxylon obliquum*, *Gasteria bicolor*, *Haworthia attenuata* and *Cissampelos capensis*. Regarding restricted reserve land, it is clear from this study that neighbouring communities desire access to resources, particularly stock range-land and fuel wood.

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## APPENDIX 1: TABLE OF AMAYEZA PLANTS AND USES

No.	Informant category	Botanical and vernacular name, voucher specimen	Use and preparation	Location and perceived abundance
1	Group discussion Nomtayi	<i>Polygala myrtifolia</i> L. - uMabalabala Dold 1673	Soft bark scraped from branches, boiled and taken for headaches. Used as an emetic (ukugabha), to cleanse body of evil spirits (Some women felt that it was too strong for children).	Collected in the Valley Bushveld; common.
	Key informant Nomtayi	<i>P. myrtifolia</i> L. uMabalabala	as above	as above
	Women's group Nomtayi	<i>vP. myrtifolia</i> L. uMabalabala	as above	as above
	Specialist Tweni	<i>P. myrtifolia</i> L. uMabalabala	as above	Collected in nearby veld.
	Key informant Tweni	<i>P. myrtifolia</i> L. uMabalabala	Used to cleanse the kidneys. The bark is scraped off and boiled in water. It is taken as an enema and is suitable for all ages and both men and women.	Common; collected in nearby veld.
	Specialist Gwabeni	<i>P. myrtifolia</i> L. uMabalabala	as above	Collected from the outskirts of the village; common.

2	Group discussion Nomtayi	<i>Cissampelos capensis</i> L.f. uMayisake Dold 1678, 1712	For stomach ache, bark mixed with water and two teaspoons taken at a time, all ages. Taken for poison in the stomach, 3 spoonfuls a day.	Collected on the outskirts of the village; common.
	Specialist Tweni	<i>C. capensis</i> L.f. uMayisake	Taken as an emetic or an enema for high temperature, (igazi elishushu) The root is also used for stomach aches. Mixed with <i>Pteronia incana</i> and <i>Clausena anisata</i> .	as above
	Key informant Tweni	<i>C. capensis</i> L.f. uMayisake	Taken for stomach aches. The roots are infused in cold water and taken as an enema. The roots can also be used to prevent wind.	as above
	Child (scholar) Ndwayana	<i>C. capensis</i> L.f. uMayisake	Taken for stomach ache.	Collected by parents.
3	Group discussion Nomtayi	<i>Artemisia afra</i> Jacq. ex Willd. uMhlonyana.	For fever, boiled in water, taken as a tea.	Not found at Nomtayi; from near Alice; rare.
	Game guards	<i>A. afra</i> Jacq. ex Willd. - uMhlonyana	As above: infusion for ear-ache (indlebe eqaqambayo) applied as drops.	Cultivated in garden.
4	Group discussion Nomtayi	<i>Brachyleana ilicifolia</i> (Lam.) Phill. & Schweick. uMqheba. Dold 1504	For sore throats and coughs. Can be chewed, boiled in water and drunk, or dry leaves can be crushed and snuffed.	Common in Valley Bushveld.
	Key informant Nomtayi	<i>B. ilicifolia</i> (Lam.) Phill. & Schweick uMqheba.	as above	Common in Valley Bushveld.
	Key informant Tweni	<i>B. ilicifolia</i> (Lam.) Phill. & Schweick uMqheba.	Taken for coughs. The leaves are boiled in water and 1 tsp. taken when needed. Bitter taste.	as above
5	Group discussion Nomtayi	<i>Cissampelos capensis</i> L.f. iDabulitye. Dold 1678	For stomach pains, root mixed with cold water and drunk.	Collected from distant forests.
6	Group discussion Nomtayi	<i>Becium burchellianum</i> (Benth.) N.E. Br. uBhubhusi Cocks 16	For fever, bark boiled in water and drunk, all ages.	Common around the village.
7	Group discussion Nomtayi	<i>Haemanthus albiflos</i> Jacq. - uMathunga.	For healing broken bones, the bulb is soaked in cold water and then drunk.	Scarce but found around the village.
	Game guards.	<i>H. albiflos</i> Jacq. uMathunga.	Root is used as a poultice and drunk to heal broken bones.	Occasional in valley bushveld.



8	Group discussion Nomtayi	<i>Bulbine frutescens</i> (L.) Willd. iYakayakana. Dold 1510	Used for pain in lower abdomen by women, mothers only. Related to childbirth, is boiled in water and drunk.	Collected from the forest far away; common.
	Key informant Nomtayi	<i>B. frutescens</i> (L.) Willd. iYakayakana	as above	as above
	Women's group Nomtayi	<i>B. frutescens</i> (L.) Willd. iYakayakana	Taken for period pain & especially to cleanse the body. It is mixed with rooi-water (53) and boiled in water and drunk.	Common in village.
	Specialist Tweni	<i>B. frutescens</i> (L.) Willd. - iYakayakana	Used as an enema for stomach poison (witchcraft implied) all ages.	Collected on the outskirts of the village.
9	Group discussion Nomtayi	<i>Haworthia attenuata</i> Haw. - iNtelezi.	For "bad stomach"(upset stomach), used as a purgative, boiled in water and drunk.	Common in Valley Bushveld, far away.
	Women's Group Nomtayi	<i>H. attenuata</i> Haw. iNtelezi	Used as a wash for itchy body and rashes, (iqhakuva). It is pulped and steeped in cold water.	Collected from surrounding veld; uncommon.
	Key informant Nomtayi	<i>H. attenuata</i> Haw. iNtelezi	Used as a wash against bad luck or evil spirits.	Cultivated in garden.
	Key informant Tweni	<i>H. attenuata</i> Haw. iNtelezi	Used as a wash to ward off evil spirits. The skin burns when applied so the pulp is diluted in water. Also used as a wash, it can also be used to ward off lightning from the home by planting it in the garden. Also for protection against misfortune such as car accidents.	as above
	Child (scholar) Ndwayana	<i>H. attenuata</i> Haw. iNtelezi	Used as a wash for protection and good luck in exams.	Collected by parents.
10	Group discussion Nomtayi	<i>Opuntia ficus-indica</i> (L.) Mill. - iTolofiya. Dold 3959	Eaten as a fruit. Collected for sale on the roadside. Fresh leaves used as a poultice to sooth fungal infection.	Scarce around the village, common in reserve.
	Game guards Reserve	<i>O. ficus-indica</i> (L.) Mill. - iTolofiya	as above	Collected from the reserve and taken home to the villages.

11	Group discussion Nomtayi	<i>Solanum nigrum</i> L. uMsobosobo Cocks 11	Vegetable collected in the rainy season by women. Cooked with mealie-meal and mealie rice.	Common during summer.
	Women's group Nomtayi	<i>S. nigrum</i> L. uMsobosobo	Eaten to relieve dryness/thirst. The bark is peeled off and eaten.	Village weed.
	Game guards	<i>S. nigrum</i> L. uMsobosobo	The fruit is eaten and the leaves are cooked as a vegetable supplement.	Roadside weed.
	Specialist Gwabeni	<i>S. nigrum</i> L. iMfino	The leaves are cooked and eaten with mealie rice, onions and fat.	Village weed.
12	Group discussion Nomtayi	<i>Cussonia spicata</i> Thunb. - uMsenge Dold 1709	The root is dug up and eaten to get liquid in drought. Reported to be used by traditional healers as an ingredient in cancer treatment.	In the forest and veld.
13	Group discussion Nomtayi	<i>Harpephyllum caffrum</i> Bernh. ex Krauss - iNgwenye	Fruit eaten while walking in the veld as a snack.	Common
14	Group discussion Nomtayi	<i>Grewia occidentalis</i> L. - iNqabaza Dold 1917	Can be eaten as a fruit, but very bitter.	Common
15	Group discussion Nomtayi.	<i>Pappea capensis</i> Eckl. & Zeyh. iLitye Dold 2265a	Fruit is eaten, locally referred to as "chappies" (snack food).	Common
	Women's group Nomtayi	<i>P. capensis</i> Eckl. & Zeyh. - iLitye	as above	Common
16	Group discussion Nomtayi	<i>Carissa bispinosa</i> (L.) Desf. ex Brenan iNcumcum Dold 1757	Berry eaten as a fruit. Forked stick from branch used as a whisk by diviners.	Common
17	Group discussion Nomtayi.	<i>Azima tetraacantha</i> Lam. - iGcegceleya Cocks 6	Wood is avoided as fuel because the smoke is poisonous.	Common
	Key informant Nomtayi	<i>A. tetraacantha</i> Lam. iGcegceleya	Roots bottled in cold water and given orally to goats experiencing delivery problems.	Common
	Women's group	<i>A. tetraacantha</i> Lam. iGcegceleya	The juice of the berries is used for ear ache, applied fresh, 2 drops directly into the ear.	Common



18	Group discussion Nomtayi	<i>Acacia karroo</i> Hayne - uMnga Cocks 4	Good firewood & coals.	Very common
	Key informant Nomtayi	<i>A. karroo</i> Hayne uMnga	Good firewood & coals	
	Women's group Nomtayi	<i>A. karroo</i> Hayne uMnga	Taken for cleansing the blood: the bark is peeled off and steeped in hot water like a tea and drunk. Suitable for both adults and children. Is also good fuel.	Collected on the outskirts of the village.
	Specialist Tweni	<i>A. karroo</i> Hayne uMnga	Softened bark is used as a bandage to heal broken bones in livestock.	as above
	Specialist Gwabeni	<i>A. karroo</i> Hayne uMnga	Pieces of the fresh bark are chewed to relieve stomach ache and bloody stools.	as above
19	Group discussion Nomtayi	<i>Olea europaea</i> L. subsp. <i>africana</i> (Mill.) P S Green uMnquma	Xhosa customs. The branches are used as a platter to serve meat from ceremonially slaughtered animals .	Common around village.
20	Group discussion Nomtayi	<i>Dianthus thunbergii</i> Hooper - uBulawu Dold 1719	Used to make foam that is drunk or rubbed onto the face for ritual customs. The root and leaves are soaked in a tin of water then a forked stick (16, 29 ) is rubbed between the palms to make foam (igwebu).	Uncommon on high ridges (eThafeni).
	Game guards	<i>D. thunbergii</i> Hooper	Emetic for good fortune (ukuhlamaba amashwa).	Collected in the reserve.
21	Key informant Nomtayi	<i>Sansevieria hyacinthoides</i> (L.) Druce - isKolokoto	Boiled mixture drunk as an emetic to expel phlegm (uxakaxa).	Commonly found in the forest.
	Women's group Nomtayi	<i>S. hyacinthoides</i> (L.) Druce isKolokoto	Used for ear-ache in both adults and children. The leaves are heated in the fire and the juice is squeezed into a teaspoon and poured into the ear.	Collected in the veld.
	Key informant Tweni	<i>S. hyacinthoides</i> (L.) Druce isKolokoto	Leaves are warmed in the fire, the juice is then squeezed directly into the ear for ear-ache.	as above
22	Key informant Nomtayi	<i>Cussonia spicata</i> Thunb. uMsenge Dold 1741	Liquid from tuber taken orally to cleanse the blood.	Common near village.
	Women's group Nomtayi	<i>C. spicata</i> Thunb. uMsenge	as above	as above
	Specialist Tweni	<i>C. spicata</i> Thunb. - uMsenge	Root eaten, the flesh is chewed and spat out for moisture only.	as above

23	Key informant Nomtayi	<i>Clausena anisata</i> (Willd.) Hook. f. ex Benth. - iPerepes Dold 1689	Boiled and taken as a tea for coughing (ukukhohlela).	Common
24	Key informant Nomtayi	<i>Olea europaea</i> L. subsp. <i>africana</i> (Mill.) P S Green uMnquma	Used as a plate/platter, for ceremonially slaughtered meat.	Very common
25	Key Informant Nomtayi	<i>Ptaeroxylon</i> <i>obliquum</i> (Thunb.) Radlk. - uMthathi Dold 1820	Mixed with <i>Olea</i> (24) and used to serve ceremonially slaughtered meat.	Common in Valley Bushveld.
	Women's group Nomtayi	<i>P. obliquum</i> (Thunb.) Radlk. - uMthathi	Fresh branches good firelighters, as good as paraffin.	as above
	Specialist Tweni	<i>P. obliquum</i> (Thunb.) Radlk. - uMthathi	The leafy branches are used as a platter for the meat of sacrificed animals.	Collected on the outskirts of the village.
	Specialist Gwabeni	<i>P. obliquum</i> (Thunb.) Radlk. - uMthathi	The fresh bark is steeped in cold water and 2 spoons of the infusion taken 3 times a day for iswekile (diabetes). This can be mixed with an infusion of umgqeba bark, <i>Brachyleana ilicifolia</i> , for the same remedy.	
26	Key informant Nomtayi	<i>Scutia myrtina</i> (Burm.f.) Kurz iSipingo.	Berries eaten as a snack in the veld.	Common
	Women's group Nomtayi	<i>S. myrtina</i> (Burm.f.) Kurz - iSipingo.	Eaten as a snack in the bush. Not collected as a staple.	Common
	Game guards	<i>S. myrtina</i> (Burm.f.) Kurz - iSipingo	The fruit is eaten as a snack.	Common
27	Key informant Nomtayi	<i>Aloe ferox</i> Mill. iKhala Dold 1696	Dry leaves are powdered and boiled for an enema for kidney problems.	Common
	Women's group Nomtayi	<i>A. ferox</i> Mill. iKhala	Sap is mixed in hot water & taken orally or as an enema to cleanse the body. Suitable for both adults and children. Also said to be used to protect infants from evil spirits: fresh sap is mixed with vaseline and smeared over the newborn infant daily for 6 months.	Common



27	Game guards	<i>A. ferox</i> Mill. iKhala	Dry leaves are boiled and used as an emetic to cleanse the stomach and for kidney ailments. Green leaves are put into chicken's drinking water to prevent them contracting poultry disease. The leaves are boiled and mixed in the cattle drinking water to prevent Redwater disease.	Common
28	Key informant Nomtayi	<i>Gazania krebsiana</i> Less. - iNongwe	Root eaten raw by children as a snack.	Occasional in open grass-land.
	Women's group Nomtayi	<i>G. krebsiana</i> Less. iNongwe	Root eaten as a snack by children. Not collected by households as a food supplement.	
29	Key informant Nomtayi	<i>Carissa bispinosa</i> (L.) Desf. ex Brenan iNcumncum Dold 1757	Fruit eaten as a snack.	Occasional in grassland.   Collected on the outskirts of the village.
	Women's group Nomtayi	<i>C. bispinosa</i> (L.) Desf. ex Brenan iNcumncum	Fruit eaten as a snack.	
	Game guards.	<i>C. bispinosa</i> (L.) Desf. ex Brenan iNcumncum	Used to cut "ixhayi" the forked stick used as a whisk to make foam (80).	
	Specialist Tweni	<i>C. bispinosa</i> (L.) Desf. ex Brenan iNcumncum	Fruit eaten as a snack.	
30	Key informant Nomtayi	<i>Solanum incanum</i> L. - uMathuma	Berries crushed and applied to ring-worm. Root is boiled and used as an enema for kidney problems.	Common weed in village.
	Women's group Nomtayi	<i>S. incanum</i> L. uMathuma	as above	as above
31	Key informant Nomtayi	<i>Taraxacum officinale</i> Weber <i>sensu lato</i> iHlaba	Eaten as a vegetable, boiled or fried in fat.	Common in disturbed places.
32	Key informant Nomtayi	<i>Haemanthus albiflos</i> Jacq. - uMathunga	The bulb is chopped up and boiled, 2 teaspoons are taken before meals to speed up the healing of broken bones.	Commonly found and found in the reserve
	Women's group Nomtayi	<i>H. albiflos</i> Jacq. uMathunga	Used to heal broken bones in both humans and livestock. The bulb is chopped and bandaged onto the limb or it can be steeped in water and drunk as a tea.	

33	Key informant Nomtayi	<i>Cissampelos capensis</i> L.f. iDabulitye Dold 1678	Root is boiled and drunk as a tonic, all sexes and ages.	Collected from the forest; plentiful.
	Women's group Nomtayi	<i>C. capensis</i> L.f. iDabulitye	Root infusion taken for stomach aches.	Also found in the reserve, but scarce.
34	Women's group Nomtayi	<i>Olea europaea</i> L. subsp. <i>africana</i> (Mill.) P S Green uMnquma	One women said that it was good for treating stomach aches. Also used for ritual purposes, as serving platter for sacrificed meat.	Common and easily found.
	Game guards	<i>O. europaea</i> L. subsp. <i>africana</i> (Mill.) P S Green uMnquma	Together with uMthathi, <i>Ptaeroxylon obliquum</i> (25) the branches are used as a platter for ceremonial meat.	Collected from the reserve, also collected to take home.
35	Women's group Nomtayi	<i>Clausena anisata</i> (Willd.) Hook. f. ex Benth. - iPerepesi Dold 1742	Taken for fevers. The leaves are crushed and soaked in warm water and drunk. Mixed with <i>Pappea capensis</i> and boiled as a tea for children when they have coughs.	Very common
	Game guards	<i>C. anisata</i> (Willd.) Hook. f. ex Benth. iPerepesi	The leaves are boiled and a tea drunk for coughing.	Collected from the reserve.
	Women's group Glenmore	<i>C. anisata</i> (Willd.) Hook. f. ex Benth. iPerepesi	Used to ward off the evil spirits from new born babies. It is burnt (ukushiza) in the house.	
36	Women's group Nomtayi	<i>Brachyleana ilicifolia</i> (Lam.) Phill. & Schweick. uMqheba Dold 1504	Taken for coughs. Suitable for both adults and children. The leaves are soaked in boiling water or the leaves can be chewed.	Collected on the outskirts of the village.
	Game guards	<i>B. ilicifolia</i> (Lam.) Phill. & Schweick. uMqheba	Leaf infusion to cure coughs and stomach ache.	as above
		<i>B. ilicifolia</i> (Lam.) Phill. & Schweick. uMqheba	Used for coughs, leaves eaten raw or boiled as a tea.	as above
	Specialist Tweni			
37	Women's group Nomtayi	<i>Leucas capensis</i> (Benth.) Engl. iPhiphiyo	Taken for head aches. The leaves are crushed and taken as a snuff.	
	Game guards	<i>L. capensis</i> (Benth.) Engl. - iPhiphiyo	The leaves are made damp and drops are squeezed into the nose for fever.	Collected on the outskirts of the village.

37	Specialist Tweni	<i>L. capensis</i> (Benth.) Engl. - iPhiphiyo	The juice of the leaves squeezed into nostrils to relieve headaches.	Collected from the veld.
	Key informant Tweni	<i>L. capensis</i> (Benth.) Engl. - iPhiphiyo	The leaves are squeezed and the sap is dropped into the nose and ears as a cure for fever.	
38	Women's group Nomtayi	<i>Exomis microphylla</i> (Thunb.) Aell. uMvenyathi Cocks 7	Taken to clear infant's phlem. The roots are cleaned, boiled in water and poured into a baby bottle for infants to drink.	
39	Women's group Nomtayi	<i>Sonchus asper</i> (L.) Hill - iHlaba	Eaten as imifino (wild vegetable).	Common weed found around the village.
	Women's group Ndwayana	<i>S. asper</i> (L.) Hill iHlaba	Eaten as imifino. To prepare it, it is firstly washed, the stems are then cut off and the leaves are boiled and added to mealie meal or mealie rice.	
40	Game guards	<i>Senecio deltoideus</i> Less. - iTyolo	Used for pimples and skin complaints.	Common in the village.
4 i	Game guards.	<i>Capparis sepiaria</i> L. iNtshilo Dold 1721, 1695	The wood is burnt and the smoke inhaled to chase away evil spirits (ukugxota into imdaka).	Common
42	Game guards	<i>Cussonia spicata</i> Thunb. - uMsenge Dold 1741	Roots are used as a food supplement in drought times.	Common
43	Game guards	<i>Schinus molle</i> L. iPepile Dold 3942	The leafy branches are used to keep flies away. Leaves boiled and taken for flu and fever.	Uncommon; cultivated.
44	Game guards	<i>Grewia occidentalis</i> L. - uMnqabaza	The fruit is eaten as a snack.	Common  Collected on the outskirts of the village.
	Specialist Tweni	<i>G. occidentalis</i> L. uMnqabaza	Fruits eaten occasionally.	
45	Game guards	<i>Pappea capensis</i> Eckl. & Zeyh. iLitye	Fruit eaten as a snack.	Collected on the outskirts of the village.
	Specialist Tweni	<i>P. capensis</i> Eckl. & Zeyh. - iLitye	Fruits eaten.	
46	Individuals Ripplemead	<i>Euphorbia triangularis</i> Desf. uMhlontlo Cocks 28	The sap is mixed weakly with water and used as a wash for newly born twins to ensure their strength. Two seedlings customarily planted near homestead when twins are born.  Stolen cow can be washed with sap to change the colour of its coat so as to avoid detection in stock theft.	Common



47	Individual Ripplemead	<i>Aloe ferox</i> Mill. iKhala. Dold 1696	The sap is put on a mother's nipple to stop a child from breastfeeding during weaning.	In village.
	Specialist Tweni	<i>A. ferox</i> Mill. iKhala.	Dried leaves boiled and liquid used for enema to cleanse the stomach.	Collected on the outskirts of the village.
	Key informant Tweni	<i>A. ferox</i> Mill. iKhala.	Taken to cleanse the stomach and kidneys. The sap from the leaves is boiled in water and used as an enema.	Collected in the veld.
48	Specialist Tweni	<i>Schotia latifolia</i> Jacq. - uMaphipha Dold 1754	Leaf & bark infusion used as a wash and taken as a tea to cleanse the blood. Strong infusion drunk to expel afterbirth in troubled delivery.	Common
49	Specialist Tweni	<i>Dioscorea sylvatica</i> (Kunth.) Eckl. iSkorpathi Cocks 5	Tuber infusion taken to induce vomiting and used as a wash for body rashes.	Rare
50	Specialist Tweni	<i>Ziziphus mucronata</i> Willd. - uMphafa Dold 17111	A concoction is drunk and used as a douche for thrush (fungal infection).	Common
51	Specialist Tweni	<i>Encephalartos altensteinii</i> Lehm. uMphanga	Stem/root infusion mixed with uMphafa (50) to treat thrush. The mixture is also taken to treat infertility in woman.	Uncommon
52	Specialist Tweni	<i>Boscia oleoides</i> (Burch. ex DC.) Toelken - iVetrhathi Dold 1669	Burnt wood smoke is used to drive away evil spirits.	Common
53	Specialist Tweni	<i>Bulbine latifolia</i> (L.f.) Roem. & Schult. iRooiwater. Dold 1509	Leaf pulp used either as a wash or an infusion drunk for body rashes (amaqhakuva).	Common
54	Specialist Tweni	<i>Dianthus thunbergii</i> Hooper iNkomoyentaba Dold 1719	It is drunk for the custom, uXhela Inkomo, the ritual slaughtering of an ox, as an emetic to cleanse the body.	Rare
55	Specialist Tweni	<i>Dianthus thunbergii</i> Hooper iNdlelazimhlope Dold 1719	It is either drunk or used as a wash to cleanse the blood.	Rare; open grassland.
56	Specialist Tweni	<i>Gunnera perpensa</i> L. - iPhuzi Dold 1808	Infusion of roots taken orally to cleanse the blood.	Rare; collected towards Alice.

57	Specialist Tweni	<i>Pteronia incana</i> (Burm.) DC. iBhossies. Dold 1500	Used to relieve coughing. Mixed with <i>Brachylaena</i> and <i>Clausena</i> , boiled and drunk for coughs.	Collected on the outskirts of the village.
	Key informant Tweni	<i>P. incana</i> (Burm.) DC. iBhossies.	Taken for fever and to expel phlem. It is mixed with <i>Brachylaena</i> and boiled in water, 1 teaspoon is taken as needed.	Collected from the veld.
	Specialist Gwabeni	<i>P. incana</i> (Burm.) DC. iBhossies	The leaves are boiled in water and drunk as a tea 2-3 times a day for coughs (ukukhohlela). Not used for small children.	Collected from veld.
58	Specialist Tweni	<i>Cotyledon orbiculata</i> L. - iSundu	The pulp is used for body wash to treat rashes; only suitable for adults.	Collected on the outskirts of the village.
	Group Glenmore	<i>C. orbiculata</i> L. iPhewule	Food plant in drought.	
59	Specialist Tweni	<i>Hermannia</i> sp. iNceba	The roots are boiled in milk and drunk as a tonic for men only (virility).	Collected on the outskirts of the village.
60	Specialist Tweni	<i>Sansevieria hyacinthoides</i> (L.) Druce - isKolokoto	The leaf is heated over the fire and the juice squeezed into the ear for earache.	Collected on the outskirts of the village.
61	Specialist Tweni	<i>Haemanthus</i> sp. c.f. <i>albiflos</i> Jacq. uMaweni	The pulped root is boiled in water and used as an enema for pain in the body and painful joints, also to cleanse the blood, all ages but diluted for children.	Collected on the outskirts of the village.
62	Specialist Tweni	<i>Putterlickia pyracantha</i> (L.) Szyszyl. uMqhaqoba	Wood good for fire.	Collected on the outskirts of the village.
63	Specialist Tweni	<i>Eriospermum</i> sp. uNonyada	Roots pulped and mixed with cold water, taken half a cup a day, very good for stomach, equivalent to Chamberlains Colic.	Collected on the outskirts of the village.
64	Specialist Tweni	<i>Boscia oleoides</i> (Burch. ex DC.) Toelken - iVetrhathi Dold 1669	Wood is burned for Ukuqhumisa, smoking out evil from the house.	Common in bush clumps.
	Key informant Tweni	<i>B. oleoides</i> (Burch. ex DC.) Toelken iVetrhathi	The roots are burned ritually inside the house, the smoke wards off evil spirits.	
65	Specialist Tweni	<i>Indigofera sessilifolia</i> DC. iMpinglele Dold 1706	Whole plant boiled with <i>Cissampelos</i> (25 & 33) and <i>Asparagus</i> (115) and infusion taken 3 times a day for poison in the stomach.	Collected on the outskirts of the village.

66	Specialist Tweni	<i>Kedrostis foetidissima</i> (Jacq.) Cogn. - iThuvish Dold 1681	Root is used as an enema for fever, all ages, diluted for children.	Collected on the outskirts of the village.
67	Specialist Tweni	<i>Ehretia rigida</i> (Thunb.) Druce uMhleli.	Fruits eaten.	Collected on the outskirts of the village.
68	Specialist Tweni	<i>Capparis fascicularis</i> DC. iNtshila Dold 1714	Fruits eaten.	Collected on the outskirts of the village.
69	Specialist Tweni	<i>Urginea</i> sp. iNqweneba Dold 1704	Used as a body wash and a spray (ukushiza) for rituals.	Collected on the outskirts of the village.
70	Specialist Tweni	<i>Plumbago auriculata</i> Lam. - iChinchin Dold 1676	Ritual staff for amaGqhiru. Used as a cosmetic for the face, roots are boiled and taken to cleanse the blood, the flowers are eaten for the same. A forked stick is cut from the branch to stir foam (see no. 79) in rituals.	Collected on the outskirts of the village.
71	Specialist Tweni	<i>Solanum incanum</i> L. uMthuma	Roots cooked and bottled, drunk and also used as an enema for men with "drops" (STD).	Collected on the outskirts of the village.
72	Specialist Tweni	<i>Portulacaria afra</i> Jacq. - iGwanishe	Grown as a kraal fence, leaves are eaten.	Collected on the outskirts of the village.
73	Specialist Tweni	<i>Rhoicissus digitata</i> (L. f.) Gilg & Brandt uMqceba Dold 1717	Climbing stem is beaten until soft and used as a rope to fasten thatch onto roofs.	Collected on the outskirts of the village.
74	Key informant Tweni  Women's group Ndwayana  Child (scholar) Ndwayana	<i>Olea europaea</i> L. subsp. <i>africana</i> (Mill.) P.S. Green uMnquma  <i>O. europaea</i> L. subsp. <i>africana</i> (Mill.) P.S. Green uMnquma  <i>O. europaea</i> L. subsp. <i>africana</i> (Mill.) P.S. Green uMnquma	Used as a plate for slaughtered meat at rituals. Also used to make Xhosa sticks (iNduku: a carved straight stick used for protection, walking, digging etc).  Used symbolically for all customs and rituals.  Used symbolically for all customs and rituals.	Common  Common  Common
75	Key informant Tweni	<i>Capparis fascicularis</i> DC. iQhagula Dold 1714	Taken to cure nose bleeds. The roots are added to water and a cupful is drunk. Frequently used in summer, because people often get nose bleeds when it is very hot.	Collected in the veld.



76	Key informant Tweni	<i>Urginea</i> sp. uMqweneba Dold 1704	Used to ward off evil spirits, in and around the home. The bulb is boiled in water and then sprayed around the house.	Collected in the veld.
77	Key informant Tweni	<i>Sporobolus</i> sp. iNgca.	Used as thatching grass.	Banks of Keiskamma River.
78	Key informant Tweni	<i>Plumbago auriculata</i> Lam. iChinchin Dold 1676	Used to ensure good luck in court cases. The roots are boiled in water and used as a body wash (iyeza lokuhlamba).	Collected in the veld.
79	Key informant Tweni	<i>Dianthus thunbergii</i> Hooper iNdlazimhlope Dold 1810	Used in Xhosa customs. The roots are mixed with water and a foam, igwebhu, is made from the mixture by whisking it with a forked stick: ixhayi. The foam is sprayed over the cow that is to be slaughtered.	Collected from veld; uncommon.
	Women's group Ndwayana.	<i>D. thunbergii</i> Hooper iNdlazimhlope Dold 1719	Used for washing to rid the person of evil, bad luck or misfortune, it is also used for "spraying"(ukushiza), this is literally the splashing of liquid onto whatever is being treated, often an animal to be slaughtered or the inner walls of a home.	Uncommon
80	Child (scholar) Ndwayana	<i>Haplocarpha</i> sp. iZicwe	Used for bandaging circumcision wounds (ukwaluka).	Grassland
81	Child (scholar) Ndwayana	<i>Gerbera viridifolia</i> (DC.) Sch. Bip. subsp. <i>natalensis</i> (Sch.Bip.) H V Hansen uPhantsikomga Dold 1718	Leaves used for bandaging circumcision wounds.	Grassland
82	Women's group Glenmore	<i>Bulbine latifolia</i> (L.f.) Roem. & Schult. iRooiwater Dold 1509	Infusion taken to treat bladder infections, also good for back-ache in both men and women.	Collected from around the settlement.
	Specialist Gwabeni	<i>B. latifolia</i> (L.f.) Roem. & Schult. iRooiwater	Crushed leaves are boiled in water and drunk as a tea to relieve burning urine (bladder infections). This can be mixed with <i>Dioscorea sylvatica</i> for same purpose.	Collected on the outskirts of the village.
83	Women's group Glenmore	<i>Pycnopus cinnabarinus</i> (Jacq. ex Fr.) Karst. iSibindi ( <b>Note:</b> this is a fungus)	Powder used to treat & prevent pimples and also acts as a sun protector.	Uncommon; in forest.

84	Women's group Glenmore  Specialist Gwabeni	<i>Marrubium vulgare</i> L. - uMhlonyana Cocks 13  <i>M. vulgare</i> L. uMhlonyana	Infusion taken for coughs and sore throats.  The leaves are boiled in water and drunk to sooth coughing (ukukhohlela).	Collected from the neighbouring village - kwaPickoli.  Collected in the veld.
85	Specialist Gwabeni	<i>Nicotiana glauca</i> R.C. Grah. iCubamfene Dold 1501	A leaf is warmed on a fire and strapped on a boil/abscess (ithumba) as a poultice /compress to draw out the infection. It is replaced as soon as the leaf dries and becomes brittle.	Collected in the veld.
86	Specialist Gwabeni	<i>Brachylaena ilicifolia</i> (Lam.) Phill. & Schweick. uMgqebqa Dold 1504	Scraped bark is mixed with the bark of uMthathi ( <i>Ptaeroxylon obliquum</i> ) steeped in cold water and 2 spoonfuls taken 3 times a day for iswekile, diabetes.	Collected on the outskirts of the village.
87	Specialist Gwabeni	<i>Lippia javanica</i> (Burm. f.) Spreng. iNzininiba Dold 1505	The leaves are boiled in water and added to milk and one cupful taken 3 times a day for coughs/coughing.	Collected on the outskirts of the village.
88	Specialist Gwabeni	<i>Aloe tenuior</i> Haw. uMjinqa Dold 1507	The leaves are chewed to relieve heart-burn. An infusion of the sap is used as an enema for constipation (uqhinile) for children.	Collected on the outskirts of the village.
89	Specialist Gwabeni	<i>Teucrium trifidum</i> Retz. - uBuhlungu Dold 1508	It is mixed with <i>Hermannia</i> sp. (60) and boiled in water. This is given to goats with stomach cramps/bile from a baby bottle two times a day.	Collected on the outskirts of the village.
90	Specialist Gwabeni	<i>Catharanthus roseus</i> (L.) G.Don. - iFlawa Dold 1511	The bark is scraped off and soaked in cold water and drunk for diabetes (iswekile).	Collected on the outskirts of the village.
91	Specialist Gwabeni	<i>Arctotis arctotoides</i> (L. f.) O. Hoffm. uBhushwa Dold 1512.	A infusion is made by boiling a plant in water. This is used as an enema (uku-cima) for children with sore stomach but must be used sparingly as an over strong infusion can be dangerous. Also used for goats that appear "drunk" and cannot stand, a small amount is poured onto a cloth and bound onto the animal's nose daily.	Collected on the outskirts of the village.
92	Specialist Gwabeni	<i>Ruta graveolens</i> L. iVentrit Dold 1513	Mixed with brandy in a teaspoon full of a mother's milk and given to a baby with wind (onomoya).	Collected on the outskirts of the village.
93	Specialist Gwabeni	<i>Malva parviflora</i> L. iJongilanga Dold 1514	An infusion is made by boiling the leaves in water, this is used as a gargle for toothache (izinyo).	Collected on the outskirts of the village.

94	Specialist Gwabeni	<i>Exomis microphylla</i> (Thunb.) Aell. uMvenyathi Cocks 7	An infusion in cold water is made. This is taken for rash/pimples (irawuzela) caused by eating freshly killed meat. Also a rash (scabies), (iratshalala) on children who swim in dams that pigs wallow in.	Collected on the outskirts of the village.
95	Specialist Gwabeni	<i>Withania somnifera</i> (L.) Dun. uBuvimba Dold 1516	The large woody rootstock is peeled and pieces of the raw flesh are chewed to relieve coughing (ukukhohlela).	Collected on the outskirts of the village.
96	Specialist Gwabeni	<i>Ledebouria revoluta</i> (L.f.) Jessop iKreketsane Dold 1518	The bulb is pulped and used as a body wash at night (iyeza lokuhlamba) to expel bad dreams/bad luck and fear. Also boiled in water and given to children to alleviate wind (onomoya), one spoon a day.	Collected on the outskirts of the village.
97	Specialist Gwabeni	<i>Rumex steudelii</i> Hochst. ex A. Rich. iDololenkonyane Dold 1519	The rootstock is pulped and infused in cold water and drunk for relieving kidney pains, ie. sore waist (isinqe).	Collected on the outskirts of the village.
98	Specialist Gwabeni	<i>Sarcostemma viminale</i> (L.) R. Br. uMbelebele Dold 1666	The stems are dried, powdered and mixed with water, this is given to cattle to encourage lactation (isaqakha).	Collected on the outskirts of the village.
99	Specialist Gwabeni	<i>Pelargonium reniforme</i> Curtis uMkumiso Dold 1667	The roots are boiled in water and the infusion is taken for bloody stools (isiso se gaza).	Collected on the outskirts of the village.
100	Specialist Gwabeni	<i>Boscia oleoides</i> (Burch. ex DC.) Toelken - iVetrhathi Dold 1669	Roots are dried and burnt, the smoke drives away evil spirits (ukuxhatha into semdhaka).	Collected on the outskirts of the village.
101	Specialist Gwabeni	<i>Rhus incisa</i> L. f. var. <i>effusa</i> (Presl) R. Fernandes uNonqutyu Dold 1670	The bark from the roots is scraped off, dried and powdered, this is mixed with cold water and taken for internal bleeding (isiso se gaza) and to heal fractured bones.	Collected on the outskirts of the village.
102	Specialist Gwabeni	<i>Urginea altissima</i> (L.f.) Baker uZabokwe Dold 1671	The base of the bulb with roots intact is boiled in water and drunk (half a cup) as a purgative (ukugaba) to cleanse the body.	Collected on the outskirts of the village.
103	Specialist Gwabeni	<i>Cadaba aphylla</i> (Thunb.) Willd. iStorom Dold 1672	The root is burnt and smoke inhaled to relieve headaches. It is commonly used to ward off lightning (izulu) sent by evil or jealous people. A seedling is planted on either side of the door.	Collected on the outskirts of the village.
104	Specialist Gwabeni	<i>Marrubium vulgare</i> L. - iMbuya Cocks 13	Eaten as an imfino - wild spinach.	Collected on the outskirts of the village.



105	Specialist Gwabeni	<i>Brachylaena elliptica</i> (Thunb.) DC. isaGqheba. Cocks 15	The leaves are chewed and swallowed two or three times a day to relieve dry coughs and asthma.	Collected on the outskirts of the village.
106	Specialist Gwabeni	<i>Becium burchellianum</i> (Benth.) N.E. Br. uBhubhusi Cocks 16	The leaves are boiled and taken as a tea for coughs. The leaves can be boiled and used as a steam for fever. This induces profuse sweating.	Collected on the outskirts of the village.
107	Specialist Gwabeni	<i>Secamone filiformis</i> (L. f.) J.H. Ross uMbijela Cocks 2	Used for livestock suffering from weak back legs known as umkhondo (staggers). The stem is ground and mixed with water, the infusion is given to the animals to drink.	Collected on the outskirts of the village.
108	Specialist Gwabeni	<i>Ledebouria</i> sp. c.f. <i>revoluta</i> (L.f.) Jessop isiThithibala Cocks 22	The tunic of the bulb is ground and boiled and left to soak for a day, then used as an enema to relieve back-ache.	Collected on the outskirts of the village.
109	Specialist Gwabeni	<i>Arctotis arctotoides</i> (L. f.) O. Hoffm. isKwamba Dold 1512	The leaves are cooked and eaten with mealie-meal, wild spinach plants are commonly known as imfino.	Collected on the outskirts of the village.
110	Specialist Gwabeni	<i>Azima tetraacantha</i> Lam. - iGcegceleya Cocks 6	The root is ground and bottled in cold water. This is given to livestock expe- riencing birthing problems (ukumelwa).	Collected on the outskirts of the village.
111	Specialist Gwabeni.	<i>Bulbine frutescens</i> (L.) Willd. iYakayakana. Dold 1510	Rootstock is sliced up and boiled to make an infusion for burning urine - bladder infections. Also used as an enema to relieve wind (onomoya) in weaning babies.	Collected on the outskirts of the village.
112	Specialist Gwabeni	<i>Gasteria bicolor</i> Haw. - iNtelezi Dold 1517, 1697	The leaves are pulped and used as a body wash (iyeza lokuhlamba) to prevent bad dreams and fear of the unknown, the same pulp is infused in water and sprinkled all over the floor and walls of the bed-room to chase away bad spirits, (ukutshiza). A small amount can be mixed with water and drunk as a tea to induce vomiting (ukugaba) for cleaning the stomach.	Collected in the veld.
113	Key informant Nomtayi	<i>Grewia robusta</i> Burch. umNqabaza	Can be eaten as a fruit, but very bitter.	Common

114	Specialist Gwabeni	<i>Silene</i> sp. Ubulawu Dold 1502	Thick fleshy roots are crushed and steeped in cold water, the infusion is warmed and drunk. Up to a gallon is taken until vomiting (ukugaba) occurs. A well known purgative to clean the stomach.	Uncommon; collected in the surroun-ding veld.
115	Specialist Tweni	<i>Asparagus</i> sp. uMathunga	The roots are mixed with water and taken to heal broken bones, all ages. The roots are dug up and mixed with cold water to heal broken bones. Two teaspoons are taken. Also used to heal broken bones in livestock.	Collected in the village.
	Specialist Gwabeni.	<i>Asparagus</i> sp. uMathunga	The root is cut up and bottled in water with a certain amount of <i>Dioscorea</i> tuber. ( <i>Dioscorea sylvatica</i> known as iskorpaati) One teaspoon of the infusion is taken three times a day for healing broken bones.	Collected in the veld.
116	Group discussion Nomtayi	<i>Ptaeroxylon obliquum</i> (Thunb.) Radlk. - uMthathi Dold 1820	Xhosa customs (isiko). The branches are used as a platter to serve meat from ceremonially slaughtered animals (goats).	Common

## APPENDIX 2: FORT MONTGOMERY: SITE SPECIFIC CULTURAL ARTIFACTS

Dr Webley of the Albany Museum’s Archaeology Department has ascertained that a sacred tree where the amaXhosa have prayed for rain in the past is located in the Double Drift Reserve.

The site was visited with a single, unemployed, male informant, about 60 years of age, from Ripplemead village. The tree is located inside the Reserve complex on the farm previously known as Fort Montgomery (33°02'55"S; 26°57'35"E), next to a small dam. The tree was identified as *Sideroxylon inerme*, a milkwood, known as *uMqwashu* in Xhosa. The informant told us that when he was a child “he had seen all the people in the whole district gather here, they had worn lots of beautiful beads and had drunk lots of beer, they had asked the ancestors to please send rain, here they had slaughtered two goats and worn the skins”. This process had reportedly taken an entire morning and after lunch the people returned to their homes whereupon it began to rain. He told us that nowadays people went to church to ask the Bible for rain but that this had never had positive results.

Approximately 1.5km away is another site (33°01'50"S; 26°57'40"E) on an open hillside with two large *Pappea capensis* trees, called *iLitye* in Xhosa. Here we were told that people would gather to ask the ancestors to bring rain and that they were “real” Xhosas (*amaQaba* - traditionalist), most of whom are now dead. After the ceremony the people would gather in the shade of the two trees and slaughter goats and drink beer, when they returned home in the afternoon it would begin to rain.

We asked if people still prayed for rain, and were told that “nowadays people have thrown all that away, since the white people had come”. We asked why these specific trees were chosen, and were told that it was because they were tall and caught the wind. It is interesting to note that the tree species appears not to be crucial but that the symbolic association with water is important.

As far as the authors have been able to ascertain, this practice has not been previously recorded in literature.

# **SOUTH AFRICA'S FIRST DINOSAUR REVISITED - HISTORY OF THE DISCOVERY OF THE STEGOSAUR *PARANTHODON AFRICANUS* (BROOM)**

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## **ABSTRACT**

The earliest dinosaur fossil recognized in South Africa was reported by William G Atherstone and Andrew G Bain in 1845, only four years after Sir Richard Owen had erected the order Dinosauria in 1841. The science of dinosaur palaeontology was still much in its infancy at the time. This fossil was initially incorrectly identified and catalogued, and it took 136 years before its affinities were correctly interpreted and it was finally given the name *Paranthodon africanus* (Broom) by Galton and Coombs (1981).

**Keywords:** *Paranthodon africanus*; history

## **HISTORICAL BACKGROUND TO THE DISCOVERY**

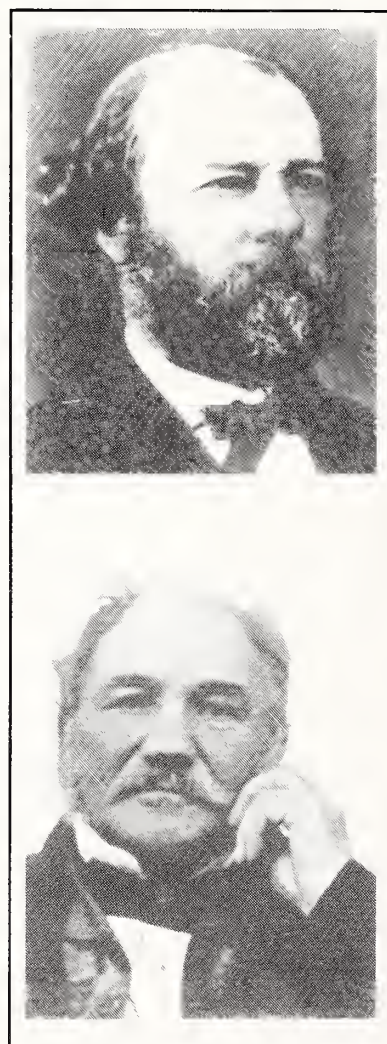
Discoveries of fossil vertebrates, including dinosaurs, were being made in the British colonies like South Africa and Australia in the early part of the 19th century, but, because of a lack of expertise, the material was usually sent back to England to be studied and described by palaeontologists like Richard Owen at the British Museum of Natural History (now the Natural History Museum) in London.

It is not widely known that the earliest report of the discovery of dinosaur bones in South Africa was made early in 1845 by two eminent pioneers of science in the Eastern Cape, William Guybon Atherstone and Andrew Geddes Bain (Fig. 1).

At the close of the Sixth Frontier War in the Eastern Cape (1834-35), Bain, a settler of Scottish descent, was appointed to the post of Assistant Engineer in the Royal Engineers to supervise the construction of military roads on the frontier, in the country around Grahamstown. His first assignment in 1837 was the construction of the "Queen's Road", between Grahamstown and Fort Beaufort through the Ecce Pass. As his daily work brought him into close contact with landforms, rocks, minerals and fossils, Bain developed a keen interest in the then relatively new science of geology. He was the first person to attempt to place the rock types he encountered over the vast tracts of the Cape Colony into a geological framework (Bain, 1857) and he can legitimately be regarded as the "father of South African geology".

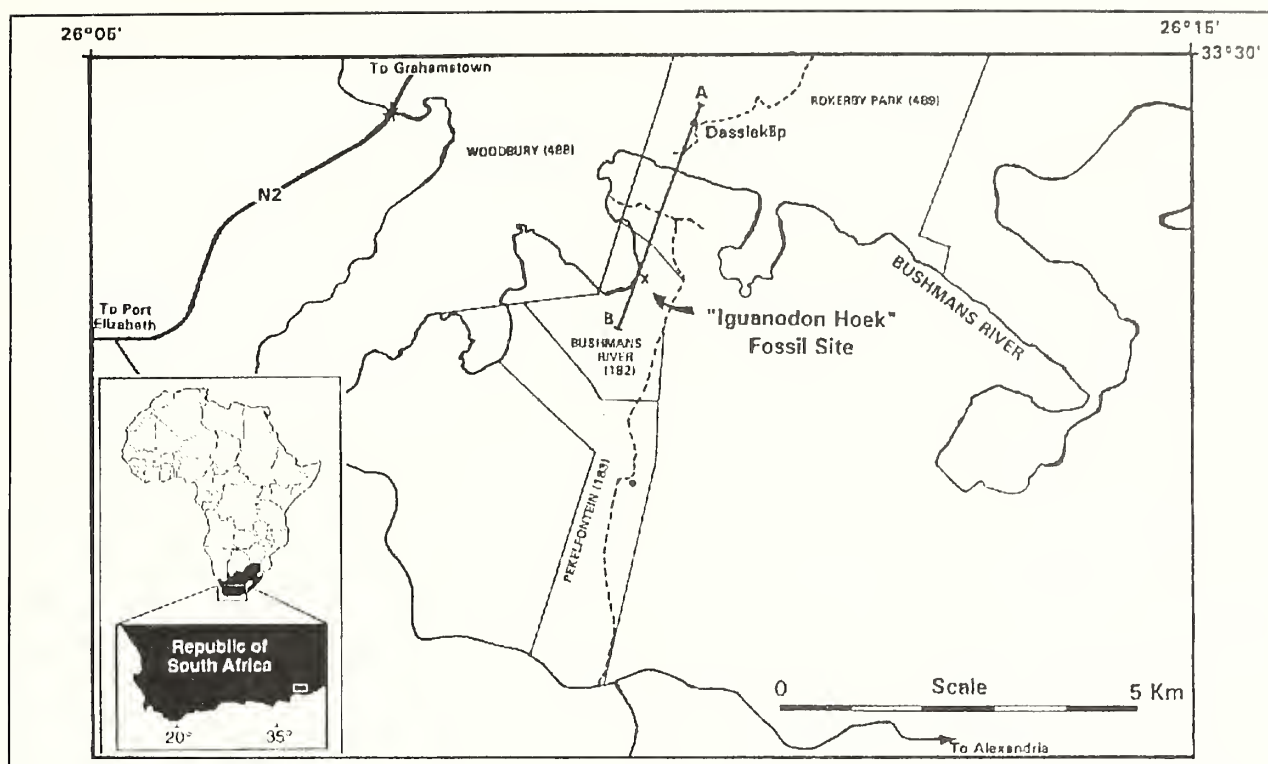
Through this interest he soon made the acquaintance of a local medical practitioner, William Guybon Atherstone, a man whose many interests included geology and who could aptly be described as a "Victorian gentleman of science".

Early in 1845 Atherstone, Bain and three of his children, took "a holiday excursion for the purpose of geological exploration" in the Eastern Cape (Atherstone, 1857:528). Atherstone did not initially set out with the main party from Grahamstown as he had



**Figure 1.** W G Atherstone (above) and A G Bain





**Figure 2.** Map of portion of the Bushmans River Valley, showing locality of "Dassieklip".

been called away to a country patient and was only able to join them late the following day. Bain and his children had travelled from Grahamstown towards Port Elizabeth and had set up camp in the vicinity of the farm Dassieklip on the Bushmans River, about half-way between Grahamstown and Port Elizabeth (Fig.2). When Atherstone arrived at the camp he was greeted by Miss Jeanie Bain who was "slowly staggering up the hill under some heavy load" of stones (Atherstone, 1857:529). He immediately went to help her and saw that they were not stones but fossilised "bones bigger than those of an ox!". The discovery of these large bone fragments caused some excitement and the question of their identity and origin generated considerable discussion late into the night.

From the textures of the bone Atherstone and Bain concluded that they were those of a very large reptile. What was lacking at that stage, though, was a diagnostic bone to give some clue as to the identity of the animal. The following day Atherstone found an upper jaw bone which included a "row of black serrated and fluted teeth" (Atherstone, 1957:530) (Fig.3).

At the time, based largely on the fluted nature of the teeth, Atherstone and Bain were

convinced that the animal was in some way related to *Iguanodon*, a dinosaur that had been discovered in 1822 by Mary Mantell in Sussex, (southern) England, and described by her husband, Gideon Mantell, in 1825.

Atherstone coined the name "*Cape Iguanodon*" for the fossil and named the discovery site "*Iguanodon Hoek*", a name which was unfortunately never formally adopted. This discovery is now accepted as the first record of a dinosaur find in South Africa, made only 23 years after the original discovery of *Iguanodon* in England – the second dinosaur ever to be formally described and named.



**Figure 3.** Left mesial view of the lower jaw of *Paranthodon africanus*. Now in the natural History Museum, London.

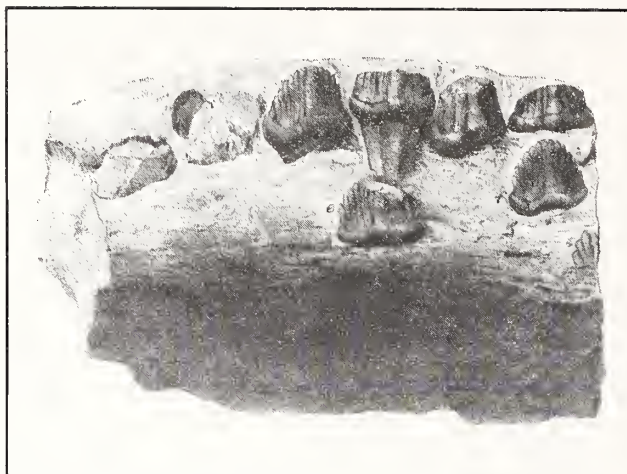
## EVENTS LEADING TO IDENTIFICATION

The science of palaeontology was still in its infancy at the time of this discovery and Atherstone and Bain were only making educated guesses about the nature of the animal. They therefore resolved to send the fossil to Richard Owen, who was at that time regarded as the most eminent palaeontologist in England, based at the British Museum in London. It was Owen who, at a meeting in Plymouth of the British Association for the Advancement of Science in 1841, coined the term "Dinosauria" (Owen, 1842) to describe the unusual group of large extinct reptiles that he was studying (Dinosauria - Greek meaning "terrible lizards"). Unfortunately only the upper jawbone and two additional skull fragments are all that remain of this find and are now housed in the Natural History Museum in London (BMNH 47338). No record of Atherstone's "bones bigger than those of an ox" have survived and it is not known if they were ever dispatched to London by Atherstone or Bain.

It took Owen 31 years before he published the first description of the Bushmans River fossil (Owen, 1876). Atherstone, frustrated at this delay, commented on this lengthy interval in 1871 in an account of a trip which he made between Grahamstown and Port Elizabeth:

"Then over the Komga [River] .... Now we pass Dassieklip, where the rocks change entirely. There, to the left, lies 'Iguanodon-Hoek', where Bain and I years ago exhumed huge bones of some extinct Saurians - one, from the jaw and serrated teeth, I fancy some huge Iguanodon. They lie still in the vaults of the British Museum, unknown, unnamed, unexamined. All that is known of them you will find in the Eastern Cape Monthly Magazine for 1857." (Atherstone, 1871:81).

The process of establishing the exact nature of the animal took a long time and a number of milestone events took place from 1845, finally culminating in the identification of the animal as *Paranthodon africanus* (Broom), a plant-eating dinosaur belonging to the Stegosauridae. Members of this group of dinosaurs are distinct in having plates on their backs and spikes on their tails - the plates were probably used for sexual display and perhaps as radiators for regulating body temperature (Galton, 1990) and the spikes were used for defence.



**Figure 4.** Owen's drawings of the jaw fragment (from Owen, 1876).

Dinosaur fossil discoveries and related events prior to the 19th century discovery of the Bushmans River fossil, have been presented by Weishampel *et al.* (1990), and by Sarjeant (1997a & 1997b). Some of these events are nevertheless worth repeating and are presented chronologically below:

### Some palaeontological events that took place in England prior to 1845.

#### 1809 -

A lower limb-bone of a large unknown animal is collected at Cuckfield by William Smith (the "father of English geology"). The fossil is deposited at the British Museum in London and years later is identified as that of *Iguanodon*.

#### 1818 -

Bones of what is called *Megalosaurus* by James Parkinson (but not formally described by him) are discovered at Stonesfield, Oxfordshire in England; they are not described until years later.

#### 1822 -

Mary Ann Mantell finds the teeth of an unknown animal near Lewes, Sussex (described in 1825 by her husband as those of *Iguanodon*) (Mantell, 1825).

#### 1824 -

Buckland publishes the first formal description of a dinosaur, using the name *Megalosaurus* which Parkinson had cited several years earlier in connection with the Stonesfield fossil (Buckland, 1824).

#### 1825 -

Gideon Mantell (1825) publishes a description of *Iguanodon*, based on the material



found by his wife in 1822.

**1841 -**

Richard Owen, of the Natural History Museum, London, proposes the ordinal taxon Dinosauria for these reptiles (Owen, 1842).

**Events relating to the discovery and ultimate identification of the Bushmans River dinosaur.**

**1845 -**

W G Atherstone and A G Bain discover the fossil of the "Cape *Iguanodon*" in the Bushmans River Valley near Dassieklip (Atherstone, 1857).

**1849 & 1853 -**

Bain sends collections of South African fossils to Sir Richard Owen at the British Museum in London for identification. Included in this general collection are the lower jaw and some skull fragments of the "Cape *Iguanodon*" from the Bushmans River (Bain, 1857; Lydekker, 1890).

**1857 -**

Atherstone publishes the account of their trip to the Bushmans River Valley and the discovery of this fossil (Atherstone, 1857).

**1871 -**

Atherstone (1871) notes that the "Cape *Iguanodon*" has still not been identified and that it is still housed in the Natural History Museum in London.

**1876 -**

Sir Richard Owen publishes an illustrated catalogue of the fossil reptiles of South Africa which includes a description and partial sketch of the fossil of "Cape *Iguanodon*", naming it *Anthodon serrarius* (Owen, 1876). It is at this time that Owen made a fundamental error which introduced confusion about this fossil into the literature. He unwittingly includes this fossil with the skull of a pareiasaur, *Anthodon serrarius*, and records the locality of both specimens as being from Bushmans River. (The *Anthodon serrarius* material was in fact collected by Bain "near Styl-Kranz, Sneewberg range" in the Karoo and would therefore have been some 100 million years older than the Bushmans River material. At this time Owen also includes several groups of animals now known not to be dinosaurs, such as the pareiasaurs, in his newly created taxon Dinosauria.)

**1890 -**

Richard Lydekker, a curator in palaeontology at the British Museum of Natural History in London, corrects Owen's mistake regarding the locality yet fails to distinguish the fossils as two unrelated species (Lydekker, 1890).

**1909 -**

Robert Broom of South Africa visits the British Museum (Natural History) and examines the Bushmans River material. He concludes that the fossil was in fact from a herbivorous dinosaur and notes that "..... when we compare the teeth with those of Cretaceous reptiles of other parts we find that they are strikingly similar to those of some herbivorous Dinosaurs." (Broom, 1910:25). Broom also notes a striking similarity between the Bushmans River teeth and a tooth of *Palaeoscincus costatus*, an ankylosaur; ankylosaurs are now regarded as closely related to stegosaurs. He suggests that as the Bushmans River teeth are so similar to those of the *Palaeoscincus costatus* it is probable that they belong to the same genus and proposes that the Bushmans River specimen be provisionally named *Palaeoscincus africanus*, emphasizing that it is definitely not the pareiasaur *Anthodon serrarius* and pretty certainly dinosaurian.

**1913 -**

E H L Schwarz, head of the Department of Geology at Rhodes University and students revisit the discovery site and find more fossil bone, including a heavy femoral head, the head of a tibia, some vertebrae and numerous smaller fragments (Schwarz, 1913). These specimens (a total of 22 fragments) are housed in the Albany Museum (AM.3755). In describing this material Schwarz, however, does not adopt the name proposed by Broom and persists with the incorrect *Anthodon serrarius*. (Recent examination of this material suggests that the Schwarz material may not be from a stegosaur but rather from some large sauropod. The material was, however, collected in the general area where Atherstone found the stegosaur.)

**1929 -**

Frans Baron Nopsca (1929), apparently unaware of the name proposed by Broom, has a fresh look at the Bushmans River fossil at



the British Museum (Natural History) and recognises that it is in fact a stegosaur, and names it *Paranthodon oweni*.

**1972 -**

Walter P Coombs re-examines the fossil and requests that it be prepared for detailed study.

**1981 -**

Peter M Galton and Walter P Coombs tie up the loose ends of this saga in their paper "*Paranthodon africanus* (Broom) - A stegosaurian dinosaur from the lower Cretaceous of South Africa" (Galton & Coombs, 1981).

### DISCUSSION

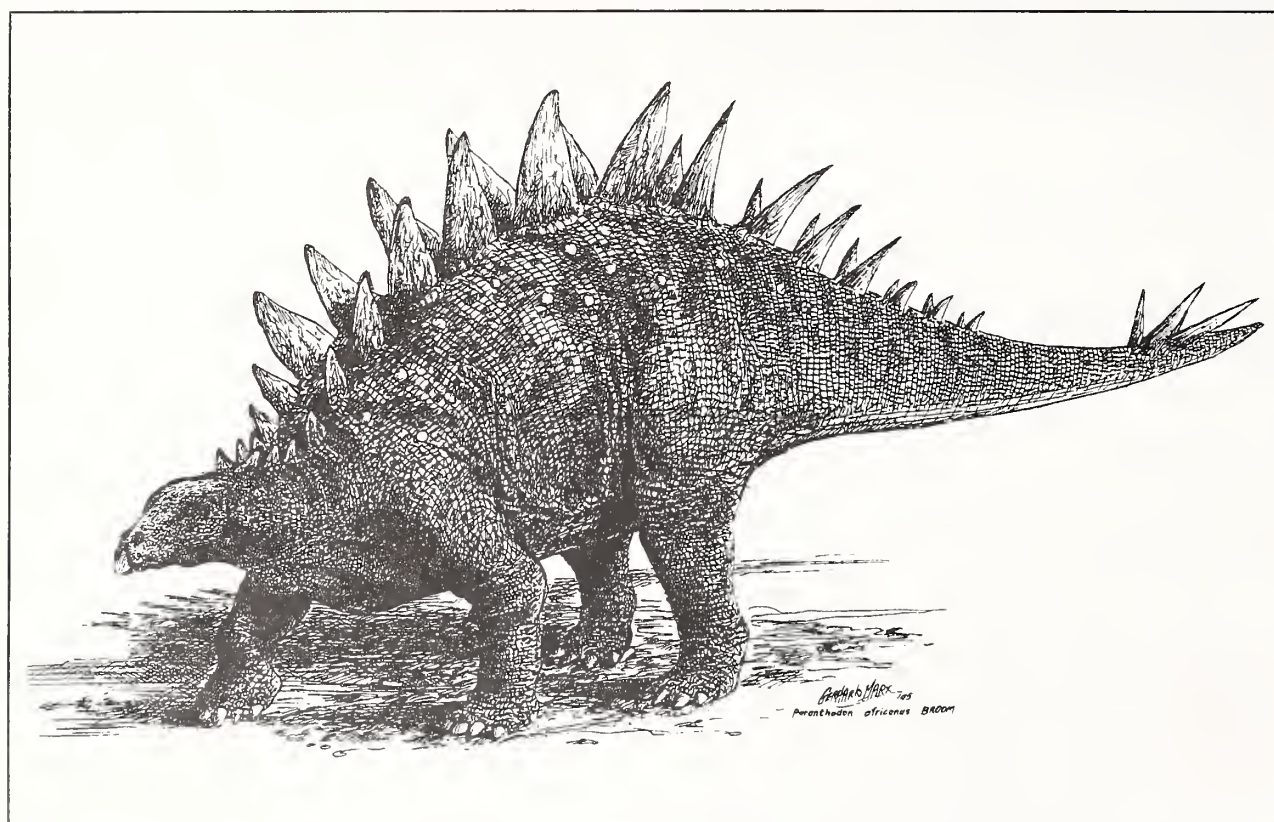
As can be seen from the sequence of events, confusion surrounded this dinosaur fossil for 136 years. A project was initiated in 1991 to relocate the original discovery site in the Bushmans River Valley. Efforts to find more fossil bone were focused on exposures of early Cretaceous fluvial siltstones and mudstones of the Kirkwood Formation (McLachlan & McMillan, 1976), the colour of the exposed sediments corresponding to the fossil bone.

These sediments are regarded as Valanginian in age (McMillan, 1999).

Initial excavations in 1992 were carried out at two fossil sites in erosion gullies in the area. They produced an abundance of fragmentary bone which, where possible, have been pieced together. It is likely that one of these sites is in fact Atherstone and Bain's original discovery site. *Ad hoc* monitoring of the site is ongoing as new fossil bone fragments are constantly being exposed by erosion of the soft mudstone (de Klerk *et al.*, 1992).

While making this investigation it was realized that the 1845 discovery was the first dinosaur fossil to have been reported from South Africa and possibly from Africa. No earlier references to dinosaur fossil discoveries in Africa have been found. It was also the first stegosaur to be found, the first of the 14 species now recognised (Galton, 1990); the first stegosaur in the literature was *Stegosaurus armatus*, described by the renowned American palaeontologist Othniel Charles Marsh in 1877. At the time the Bushmans River stegosaur had not been recognised for what it was.

The year 1995 marked the 150th anniversary of the discovery of *Paranthodon* and, to



**Figure 5.** The Albany Museum reconstruction of *Paranthodon africanus*.

commemorate this event, a five-metre long life-sized reconstruction of the animal was constructed at the Albany Museum in Grahamstown, South Africa (Fig.5). The post-cranial morphology of the reconstruction is loosely based on *Kentrosaurus* from the late Jurassic Tendaguru Basin in Tanzania (Hennig, 1915) and to a lesser extent on *Tuojiangosaurus* from the late Jurassic of Sichuan in China (Dong, 1992). The reason for basing the reconstruction on these two stegosaurs is that the form of the teeth of *Paranthodon* bears closer similarity to these species than to *Stegosaurus* from the late Jurassic Morrison Formation in the USA. In addition, there is a close similarity in body shape between *Kentrosaurus* and *Tuojiangosaurus*, both of which have back plates which are narrower and more pointed than those of *Stegosaurus* (Dong, 1988). The similarities between the teeth of *Paranthodon* and *Kentrosaurus* suggest they are more closely related than either is to *Stegosaurus*, as is perhaps to be expected because of their geographic proximity. It has also been suggested that the apparent relationship between *Kentrosaurus*, *Paranthodon* and the Indian stegosaur *Dravidosaurus* may be an indication that Gondwana stegosaurs evolved in the late

Jurassic and Cretaceous in isolation from the northern hemisphere Laurasian stegosaurs (Bonaparte, 1986).

## ACKNOWLEDGEMENTS

The unravelling of this fascinating chapter in South African palaeontology was stimulated by Jack Skead of Port Elizabeth, a 'naturalist' in the best tradition, who in 1990 had come across a reference to "*Iguanodon* Hoek" in his research into place names in the Eastern Cape. His inquiry about this locality from Mike Raath (then Director of the Port Elizabeth Museum), and later the author, led to the site being reinvestigated from 1991 onward. I would like to pay special tribute to Mike Raath for his encouragement in our attempts to accurately identify the locality of this important fossil find. I also thank the many interested palaeontologists and colleagues who, over the years, accompanied the author to the general field area and for their invaluable input and discussions - Gideon Rossouw, Norton Hiller, James Kitching and Wouter Holleman. In conclusion I would thank Wouter Holleman and Mike Raath for their critical review of this paper and Gerhard Marx for the accompanying artwork.

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